MODERN PLASTICS

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Cover color this month MAYAN BLUE (Created by Textile Color Card Association)

Next Month

In a charming studio apartment high up in Manhattan overlooking Central Park, McClelland Barclay noted American painter and sculptor works and lives during the Winter months. Furnishings, naturally, are of his own design—custom made. And since we like the way he has used laminated plastics in his dining room we shall picture and describe this room for our readers in the February issue.

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THE amazing rapid development, growth and use of plastics during the past decade is an outstanding industrial phenomenon. Fortunate, therefore, that Richardson built up, first of all, its laboratories of design, research and engineering. These laboratories are staffed by men whose sole interest is the practical application of INSUROK—and other plastics—to countless products. Through this service Richardson enables business to avoid costly experimentation and loss.

Many have found Richardson Technical counsel and guidance of immeasurable value in their problems involving the use of plastics. This same service is extended to you without cost or obligation. Details and literature will be sent on request.

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MODERN PLASTICS
JANUARY 1938 VOLUME 15 NUMBER 5

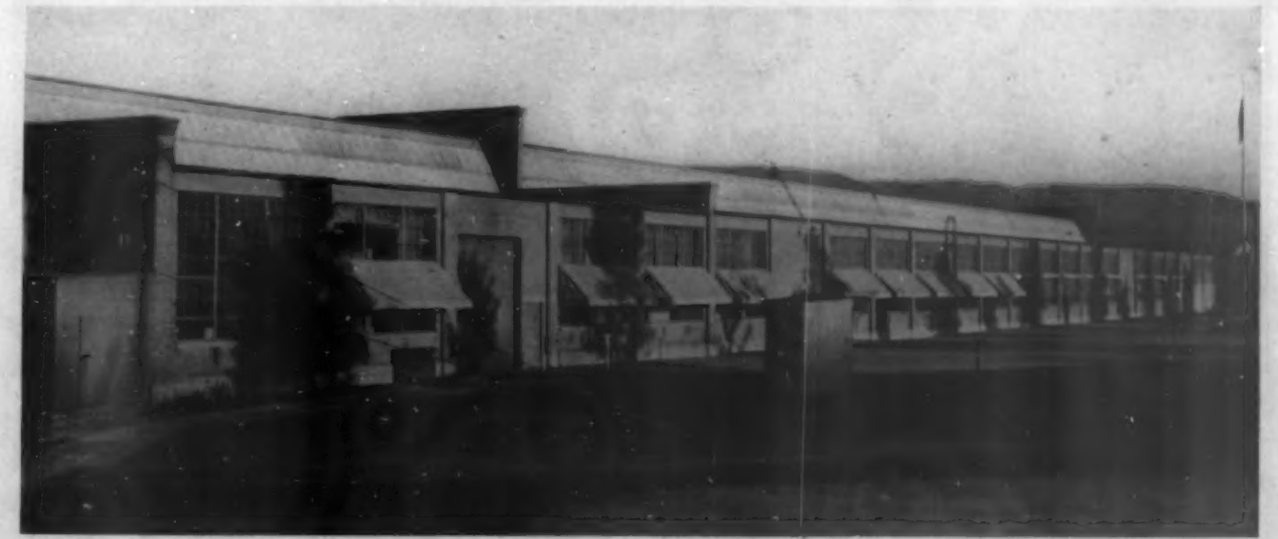
ONE PLASTICS AVENUE

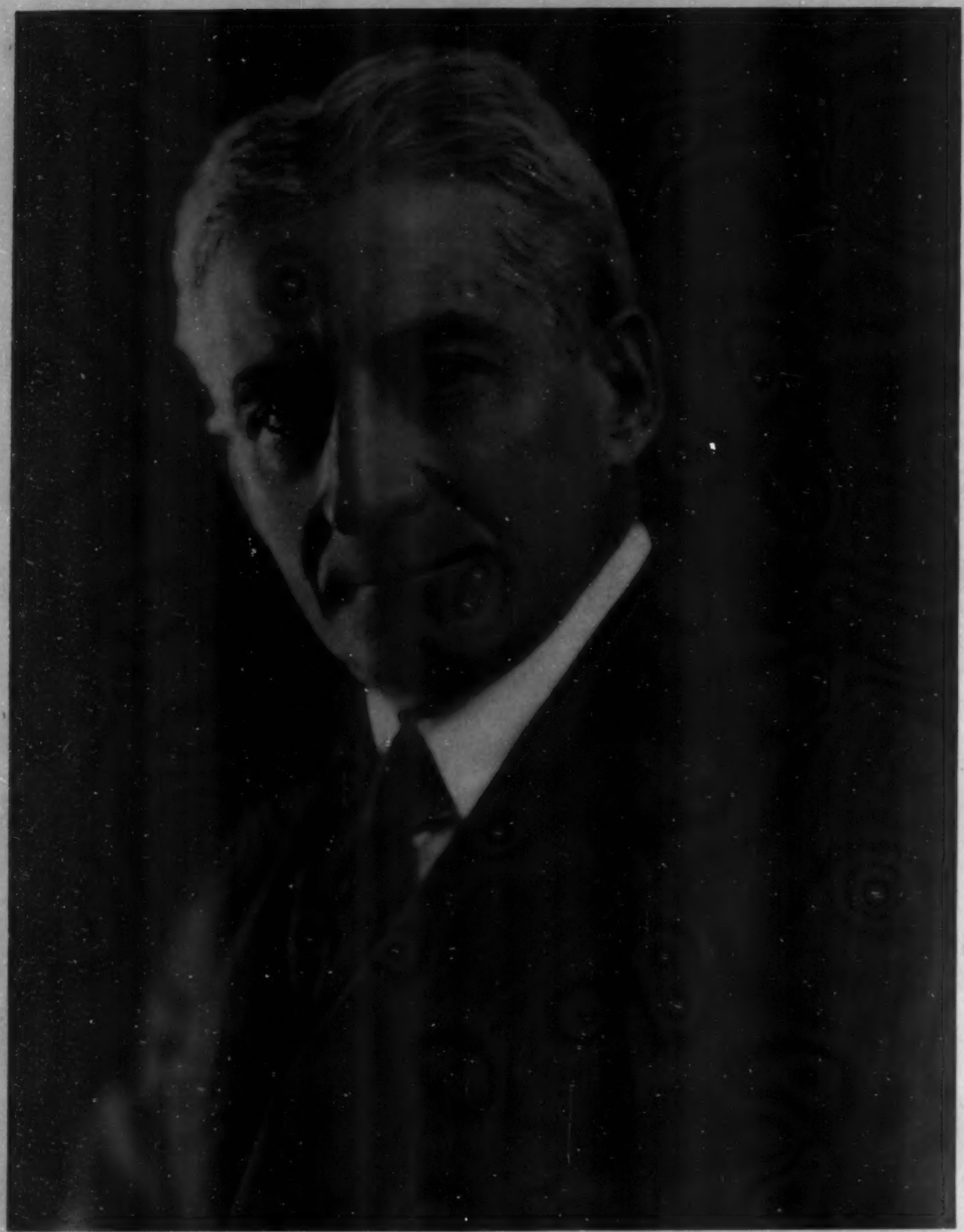
With an investment of nearly a million dollars this new molding plant indicates the forward trend of a rapidly growing industry

DESTINED TO BECOME A FAMOUS ADDRESS—One Plastics Avenue identifies the location of General Electric Company's new molding plant at Pittsfield, Mass., where all administration of the various plastics activities of the company are now coordinated. Starting with raw materials through designing, engineering, tool and die making, molding, and sales, each operation is outlined according to its functional tie-in between the various activities and brought together into a cohesive unit that should result in concentrated effort and increased efficiency.

This does not mean that all G. E. molding is undertaken under this one roof. The laminating plant is still located in West Lynn, Mass. Urea and other moldings are produced in Fort Wayne, Ind., and Meriden, Conn. A cold molding plant is also maintained at Meriden. In all these plants there are 650 molding presses, 325 of which are in the new set-up which we shall picture and describe.

The building at One Plastics Avenue was formerly used for the manufacture of ceramics which operation has been transferred elsewhere. With reconstruction costs and the installation of a huge battery of G. E. designed and manufactured presses, injection molding presses, tool room equipment and supertherm installation, it represents an investment of about a million dollars.





GERARD SWOPE, PRESIDENT, GENERAL ELECTRIC COMPANY

MR. SWOPE SAYS—

WHEN ASKED ABOUT THE COURAGE REQUIRED to make such substantial investments in new plant and equipment under present business conditions, Gerard Swope, president of General Electric replied:

"The answer to your question is much like my question to Mr. Ford when he spent hundreds of millions of dollars in going from the Model T to his new model. When I asked him if it didn't take a great deal of courage to spend that amount of money he said, 'I have the money. I believe this is progress. Why shouldn't I spend it?'

"I might say also that we look forward with confidence in the immediate and ultimate future of the development of business, especially along new lines, in which category plastics come. The needs of 130 millions of people afford from year to year a tremendously large and ever-increasing business.

"Perhaps the general conception of plastics is the molding kind only, but when you consider laminated materials and plywood with a binder of plastics, the opportunities become so great that no one can safely predict their future. Industry needs these materials in increasing quantities and through improved facilities and more efficient performance we shall be in a better position to make our contribution to the progress of the plastics industry."

Long before the discovery of phenolic plastics, General Electric Company was in the molding business. Shellac and other compounds were generously used in the manufacture of electrical equipment for industrial and home appliances. Cold molding of cements, asbestos and such combinations were also among the ingredients employed for better insulation before phenolics came along. When phenol compounds were produced, G. E. became one of the first users. Each new material as it appeared found enthusiastic reception in the laboratories and production departments of the company and through persistent research and development, invention, and experimentation, methods of molding, laminating, and fabricating have been improved.

The plastics development at G. E. has been built entirely upon the premise of demand. First for company requirements in the manufacture of electrical parts and appliances. Then to meet the requirements of industry for facilities to manufacture large and difficult moldings from plastic materials, such as the Toledo Scale, the Western Union Teleprinter housing and the huge Wakefield reflector, which are numbered among the largest plastic moldings undertaken in this country up to the present time. Large modlings, however, are only a part of the major program at G. E. It is the increasing need of more rapid production of millions of smaller industrial moldings that prompted the creation of new and more efficient presses, greater concentration of effort in planning and producing, and the assembling of these facilities in the new plant.

This consolidation is an indication of the trend of the industry toward greater expansion to meet increasing demands and it reflects the seriousness with which G. E. views the possibilities of plastics and the confidence this company entertains in the future of our industrial structure. The management feels that personnel or man power is of equal importance to plant; and the organization is clean-cut and well-defined with almost no overlapping of duties or responsibility. The new set-up is laid out in four main departments—Engineering, Manufacturing, Financial and Sales. Personnel chart of this executive organization appears on page 82.

Each division is headed by a man well qualified in background and experience to maintain the rigid standards for which G. E. is well known. Each is responsible for the performance of his department and tackles its problems with enthusiasm and persistence.

Laboratories

We will begin our trip of inspection with the laboratories and the resin plant. The first step in Engineering, of course, is the laboratories of which there are three; Research, Development, and Control. The Research Laboratory probes into the organic chemistry of resins; the Development Laboratory develops resins, varnishes, and compounds to a point where they can be used in production, while the engineers of the Control Laboratory supervise the quality of the compounds and materials at various stages of manufacture, as well as the quality of the finished product.

When the Research department makes a worth-while discovery, it is passed on to the Development department where the discovery is translated into an improved

Three views of G. E. laboratories in which you see (Fig. 1) experimental batches of new resin being reacted in lab kettles—(Figs. 2, 3) parts being molded and tested before the materials are placed in production in the resin plant

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One half the tool room is shown above (Fig. 4) while below and on the opposite page some of the intricacies of tool making may be seen. Fig. 5. Hand engraving in solid steel. Fig. 6. Making duplicate cavities from a master on a duplicating machine. Fig. 7. Completed mold being checked for accuracy. Fig. 8. One of the indispensable high speed shapers. Fig. 9. A grinding wheel the size of a dentist's drill is used to set pins in the assembly of molds. Fig. 10. Holes may be drilled at any angle with this radial drill. Fig. 11. An eight-inch chip being planed from a block of solid steel on a hydraulic planer (Fig. 12) which begins the work on most molds. Fig. 13. From one to six channels are drilled simultaneously up to a depth of 24 in. into solid blocks of steel with this intricate machine

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material or method as the case may be. Then it goes to the Control department where the materials going into the compounds are studied as to their behavior under any given set of circumstances and specifications. It is in these laboratories that materials of special characteristics are created and developed and where new uses are initiated and unusual demands for extraordinary properties are continually met.

Constant research goes on largely for the purpose of creating and developing new and improved molding compounds and laminating varnishes. Work is now under way to determine the practicability of combining unsaturated types of resins with phenolics. It is hoped through such combinations to secure greater strength, flexibility, light-fastness, and particularly, greater resistance to shock. Some progress also, is being made in getting lighter colored phenolics and a great deal of work has been done along these lines. Phenol resins so far have discolored when subjected to ultra violet light. They have a tendency to become yellow.

Two small vacuum kettles, miniature replicas of the huge resin kettles in the resin plant, are used in the Research Laboratory for reacting small batches of resins. As soon as trial resins are ready, they are transferred to the Development Laboratory directly beneath, where they are ground in a miniature Banbury mixer. Fillers, pigments, and lubricants are added and each batch yields approximately two pounds of molding compound. The sample compound is then molded into the shape of a disc, for strength tests; a radio tube base, to see what flow the material has; and bars for impact tests. Thus it is determined whether or not a new mixture has promise.

The laboratories are equipped with Dopp kettles for making larger experimental batches and with almost every known standard device for testing. One of the most interesting is the Weather-Ometer, used for testing molded parts, which gives an effect of water and sunlight by means of ultra-violet rays and a fountain which "rains" clean water constantly upon the parts being tested. One month in the machine is equivalent to a year of exposure out of doors under all weather condi-

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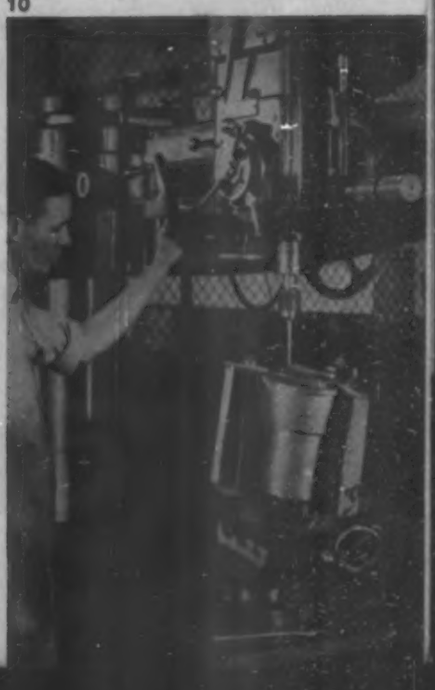

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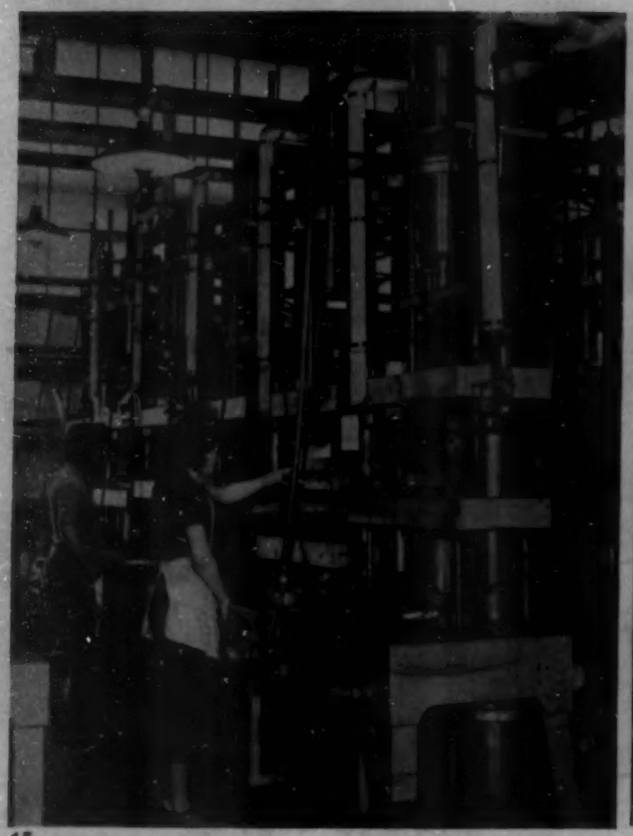

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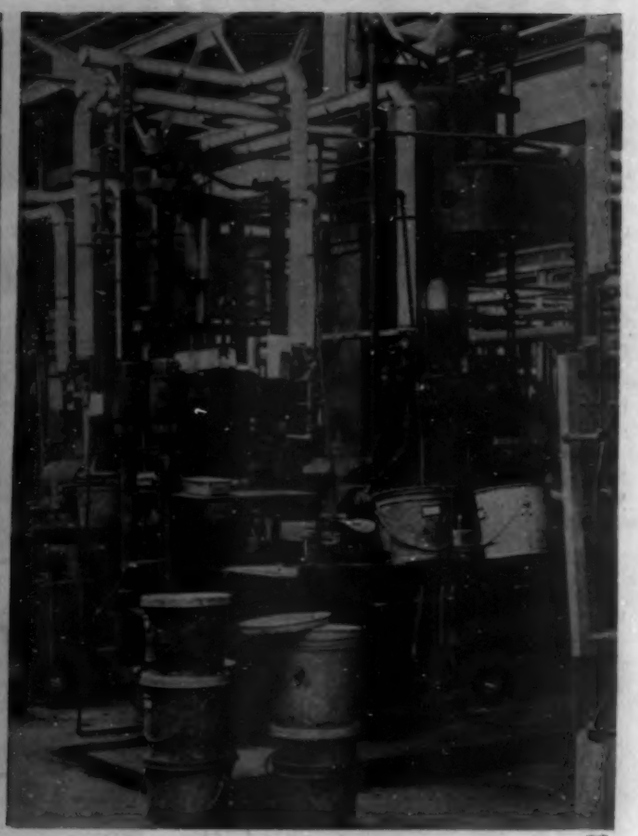

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Center aisle in the 250 ft. molding room (Fig. 14) which is flanked on one side (at the far end) by a bank of high-speed presses (Fig. 15) designed and manufactured in the G. E. plant, and on the other side by a battery of side-ram presses (Fig. 16) in which complicated parts are molded. On the opposite page, Fig. 17 shows an overhead crane which handles the heavy molds, placing them on an electric truck (Fig. 18) which carries them to the presses

tions. A new mold was being made when we visited the plant, to produce a part for testing which will combine all features that occur in a variety of molded pieces—thick sections; thin sections; inserts; raised portions with sharp corners and with rounded corners; holes that are square, round, molded in, and drilled. It is believed this will reveal more from the tests than plain boxes or other molded parts.

Resins for the laminating plant are also created and tested in these laboratories and there are miniature machines for experimental coating of cloth and paper with varnish for laminating purposes. A small experimental oven, an exact miniature of the large ones in the laminating plant at West Lynn, is used for test production of materials for gear blanks, refrigerator strips and such. An impressive and delicate apparatus housed in a booth is used to distill acids as required. Chemicals are difficult to analyze, and it takes practically an entire day to run a batch through the distillator because the liquid travels slowly.

The Control laboratory is equipped with every sort of testing device—drying ovens, acetone testers, impact devices, etc., to determine the behavior of various types of resins in the production departments. Small molding presses are installed here to establish the rate of cure and to determine the molding cycle before the newly created resins are put into production in the molding plant.

The resin plant where Textolite, a phenolic molding compound, is turned out in sufficient quantities to take care of molding demands, is located in the same building, and about seven million pounds of compound are produced per year. Textolite is used exclusively by G. E. in its molding operations and the Company does not sell plastic materials as such to the molding trade. As a matter of fact, some of the molding compounds used by the Company are purchased from outside suppliers including all the ureas, acetates and acrylic resins.

Leaving the resin plant, let's drive down Plastics Avenue to Number One where the molding plant is located in a building 480 feet long by 225 feet wide, with a background of the Berkshire Hills surrounding it for miles. We pass through a spacious reception hall, where molded parts are displayed in glass cases, and enter a corridor lined with executive offices on either side. Visiting the chief of Engineering, Research and Development Departments, we get an insight into the planning that is going on. "Our job," he says, "is to look after the future so that when the future arrives we will be among those present. There are two main angles to research and development in (*Please turn to page 70*)

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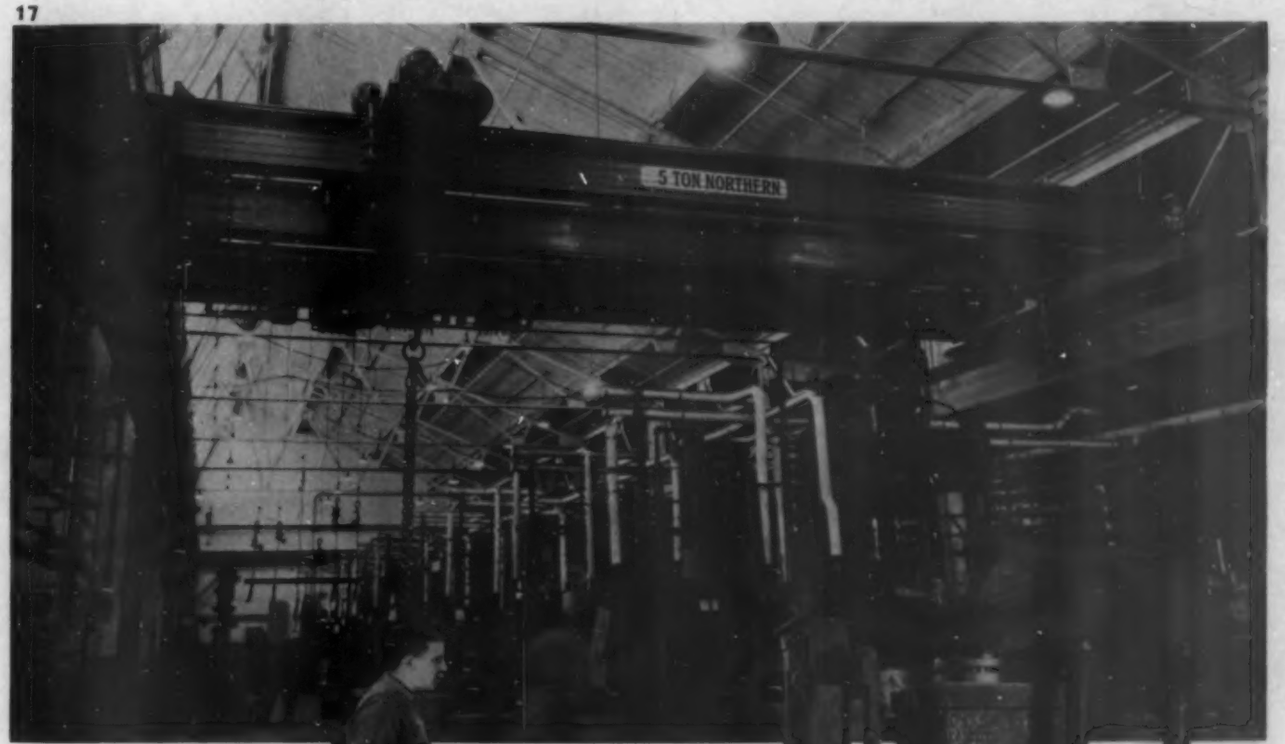

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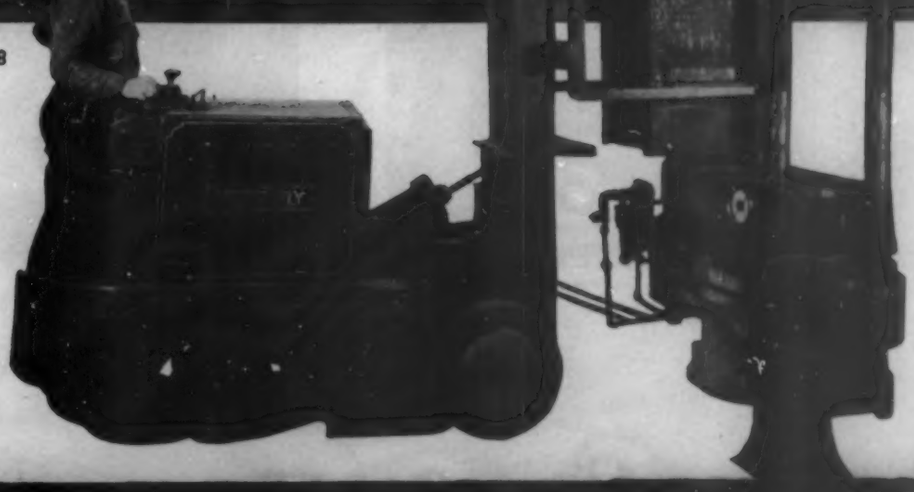


NOTED AT PARIS EXPOSITION

by BELLE KOGAN

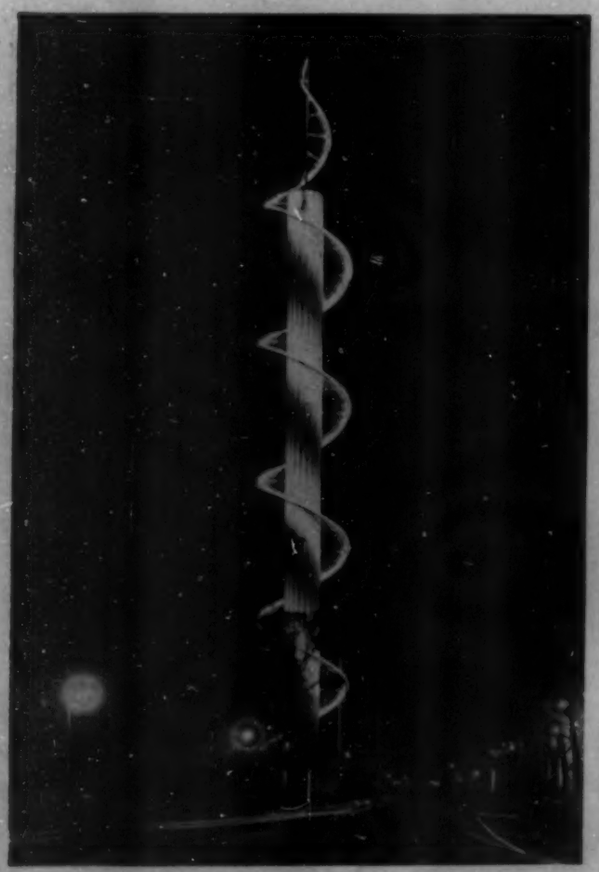
Cellulose acetate plastics were used in many ways in Paris which may interest those exhibiting at the New York World's Fair

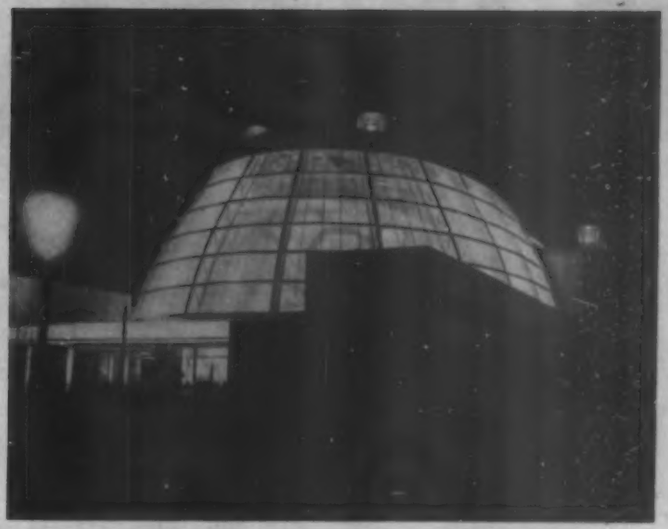
ONE OF THE MOST INTERESTING FEATURES OF the Paris International Exposition was the astonishing number of uses made of plastics, particularly the cellulose acetate product of the Societe Des Usines Chimiques, Rhone-Poulenc. This company cooperated with artists and manufacturers to extend the use of plastic materials in the fields of architecture, decoration, furniture, fashion, lighting and publicity. So successfully are these materials incorporated into the plans of the buildings, that their presence gives added interest, without being an obviously new material.

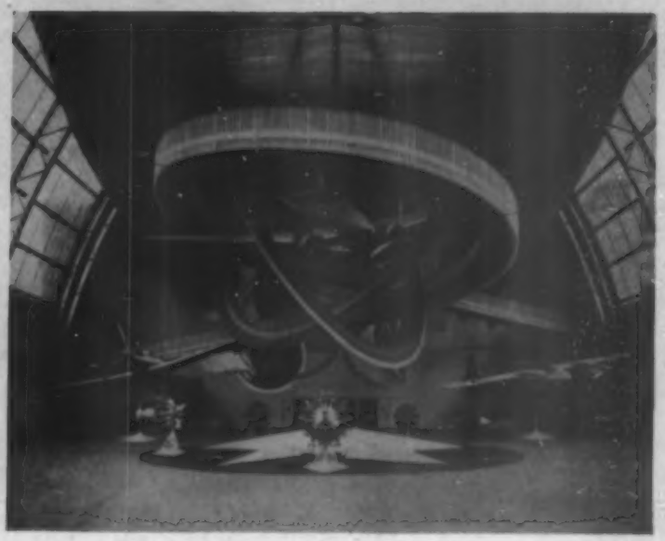
The imposing dome of *The Hall of Aviation* is rendered entirely transparent by the use of panes of transparent corrugated sheet acetate. The blue ribbon of *The Helicoidal Tower* situated at the entrance of the *Hall of Transportation* which is done in light blue corrugated material, stands out high above the city of Paris, and symbolizes both the daring of the architecture and the success of the French Merchant Marine. In the *Hall of Feminine Arts* there is a wall of translucent embossed cellulose acetate in a diamond shaped pattern. *The Wine Tower*, 30 meters high, is constructed with a central transparent column of the same corrugated material over which flows a rose colored wine. The Planetarium, where the movements of the planets and stars surrounding the earth are shown, is overhung by an enormous rainbow made of corrugated plastic colored according to the different hues of the solar spectrum.

All photographs courtesy Societe Des Usines Chimiques, Rhone-Poulenc, Paris. Information on the use of plastics, Robert D. Midiere of the Rhone-Poulenc Co.

The Blue Ribbon tower, 80 meters high, is made of sky blue transparent corrugated Rhodoid and lighted at night. The Eiffel Tower, below at right, is lighted with powerful projectors covered with transparent screens of the same material







At the left, above, are two views showing the use of Rhodoid in modern interiors. At the right is a night view of the Hall of Aviation showing transparent roof and below, the interior of the dome of the same building in which the walk is enclosed with the same transparent material

In the field of decoration we find an innovation in the use of embossed perliane used as a wall covering in the *Plastics Material Pavilion*. The entire wall is dotted with small plastic flowers which hide the joining point of each of the sections. This decoration is certainly one of the most novel and striking features in the field of decoration, which plays so important a part in the Exposition. In the transparent dome of the *Hall of Aviation*, cellulose acetate is used in the immense curves and rainbows, and for the walk going around the dome, permitting visitors to see a suspended airplane from all possible angles. A new plastic novelty, which comes in glistening white sheets, gives a perfect impression of snow, and is used for the mural decoration of the Snow Tower, the chief attraction of the *Hall of Refrigeration*.

There were some interesting developments in the field of furniture, too, principally the furniture designed by Phillippe Petit for the *Hall of Tourist Information* at the *Decorative Artists' Pavilion*. Tables, chairs, and couches were all in green crystal cellulose acetate and chrome metal. Arm chairs, chairs, and tables of this same material, designed by Kohlman and J. & M. Andre, were shown in the *Modern Artists' Pavilion* and *Louvre Pavilion*. Dressing tables, consoles, chaise lounges, screens, seats, stools, and tables of plastics combined with metal or wood were shown at the *Plastics Material Pavilion*.

The most interesting developments in the field of fashion were plastic hats by Agnes, glass fabrics and cellulose scarfs by Colcombet, spangled dresses, mules and shoes with transparent cellulose acetate tops, and decorative flowers in florescent material or perliane.

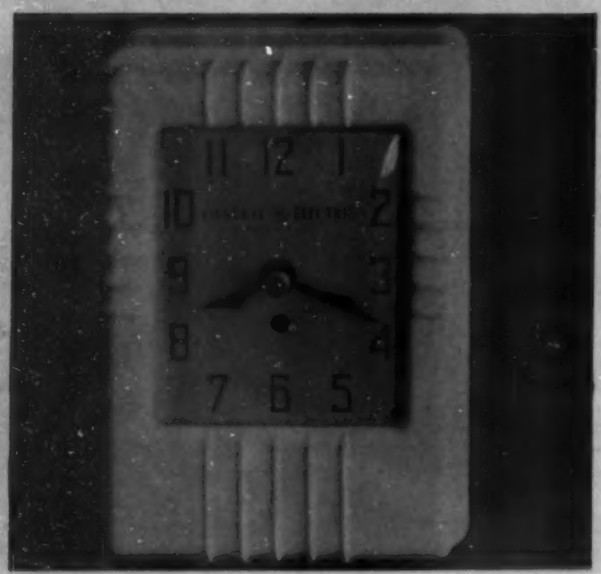
The use of cellulose acetate in the manufacture of lamp shades is not new, but there were some really new uses of plastics in the field of out- (*Please turn to page 64*)

PLASKON

. . . as used by General Electric

Plaskon congratulates General Electric Company on their new and ultra-modern molding plant at Pittsfield. Plaskon also presents below two G. E. moldings, typical of the craftsmanship which goes into each of the millions of Plaskon moldings produced every year by G. E. plants.

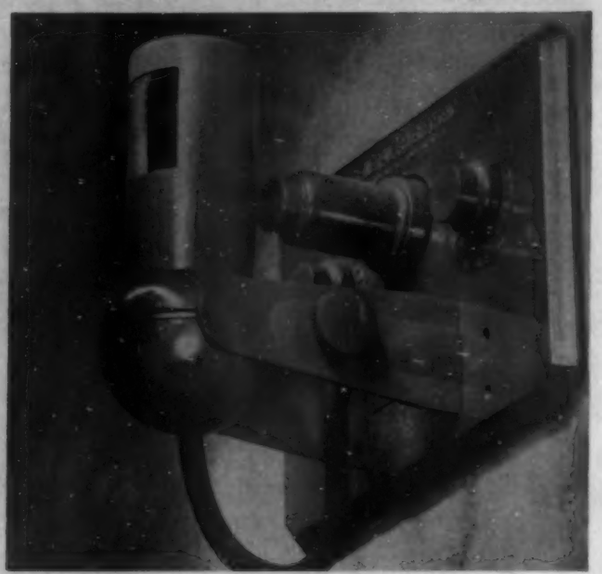
CONTROL CASE:



Today's home has pastel walls, cream or ivory woodwork, lighter, gayer colors throughout. So, if you want people to like your heating and air-conditioning controls, mold their cases of Plaskon.

That's what General Electric does. Here's a time switch case which fits any modern decorating scheme . . . molded of Ivory Plaskon. This soft, warm tone makes any product look better and sell better, makes it more modern. Ivory Plaskon is one of the most widely used plastic pastel colors, which indicates its universal consumer appeal.

PHOTO-ELECTRIC RELAY:

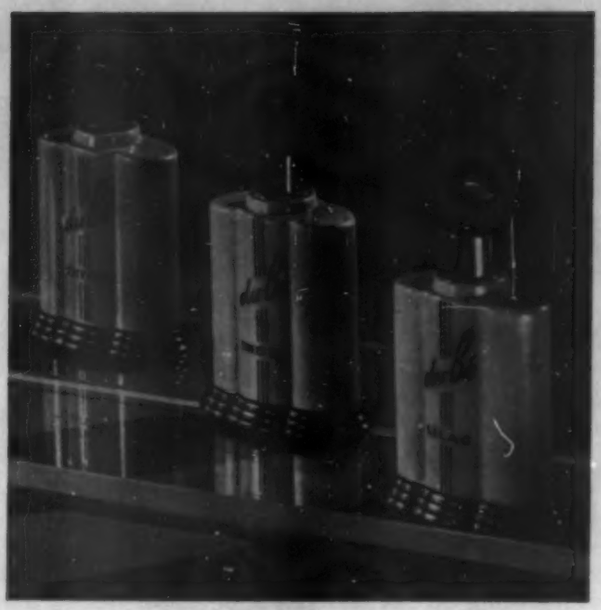


Automatic Lighting Control—which means that lights snap on whenever natural light fades below proper level—can now be had inexpensively with this new G. E. device.

Gray Plaskon is the material used, and all of the molded parts are made in a single press operation with all color, lustre, and detail automatically formed.

Plaskon is an ideal material for electrical devices, because of its permanent color, dielectric strength, chip-proof finish, and ease of forming.

JANUARY • 1938



PERFUME FLASKS:

Plaskon cases for perfume bottles are a new packaging wrinkle—pioneered by Parfums du Be. It's a smart new way to put color on a package.

Inside the Plaskon case is a small glass vial, with the neck protruding through a hole in the top. Cemented to the bottom is a molded base. Each odor uses a different Plaskon pastel color, and the case reduces chance of breakage and tipping.

Just another example of how Plaskon—molded color—adds appeal and interest to a package. Niagara Insul-Bake Specialty Co. is the molder.

WHITE PRESCRIPTION CAPS:

When the largest bottle manufacturer in the country—Owens Illinois Glass Co.—puts white Plaskon caps on prescription bottles, you can bet there's a decided preference for them.

And if druggists prefer these white Plaskon caps, you can bet their customers do, too. They look cleaner, more sanitary . . . convey the same feeling of purity as a doctor's white gown. And Plaskon is inert to alcohol and drugs, can't rust or discolor.

Perhaps your product would sell better in clean, sanitary white. If so, investigate Plaskon today.

What has been done with Plaskon by capable designers and engineers in the field of household appliances and elsewhere, has been translated into sales success by wide awake sales managers and merchandising staffs. For detailed information on colorful, light weight, permanent-finish Plaskon, write the world's largest producers of urea molding materials.

PLASKON COMPANY
INCORPORATED

LAMINATED WOVEN VENEER

by EVE MAIN

BY A PATENTED PROCESS OF SURFACING AND laminating with thermoplastics, a new material with all the charm and decorative value of fine marquetry, is made as flexible as a sheet of cardboard so that it can be fitted into corners and bent around curved surfaces without cracking or marring the pattern. Recently introduced by the Parkwood Corporation and not yet produced in any great quantities, this material has aroused considerable interest among designers, architects and manufacturers who recognize in it unlimited possibilities for unusual decorative effects.

There are four different forms in which the material is available, each identified by an individual trade name, but all are processed in the same manner. The first is made up of thin strips of wood veneer woven by hand into sheets up to 21 by 51 inches. The strips run diagonally or straight, according to the pattern, from one side of the sheet to the other without a break, and are closely woven to lock the corners tightly together leaving no pinholes between. A sheet surfacing of clear, transparent cellulose acetate is applied to either one or both sides and the entire piece is subjected to tremendous pressure in a hot plate press and remains under pressure until cooled. The result is a sheet of great strength with a hard surface which is dull, polished, or pebbled according to the finishing plate used in the press, yet pliable enough so that it can be shaped to almost any contour. The most practical method is to finish but one side, leaving the natural wood on the other side to which adhesive may be applied for cementing the sheet into position. Once processed, the large sheets may be cut to size for installation.

All kinds of wood are being employed including walnut, African mahogany, Mexican mahogany, American birch, tiger wood, etc. By varying the width of the strips, changing the type of weave, or combining light and dark woods, it is possible to supply designs suitable for almost any application.

If a special color scheme in a room is to be carried out, a sheet surfacing of colored transparent cellulose acetate furnishes the desired chroma. This, when pressed, gives the wood an exquisite colored sheen without concealing or detracting in any way from the effectiveness of the grain. A similar result achieved by staining the wood is likely to look artificial and invariably much of the detail of the grain is lost.

A metallic note is introduced in a third type which consists of strips of wood veneer and metal—brass, copper or aluminum—woven together, surfaced with clear, transparent cellulose and pressed. These patterns are particularly ornamental because artificial light picks up the gleam of the polished metal and brings out the natural beauty of the wood. The acetate surfacing protects the metal and keeps it from tarnishing or changing color.

The fourth adaptation of this material is made by regulating the weave of strips of veneer to leave half-inch spaces between. Then the sheet is backed with clear or colored cellulose, surfaced with the regular transparent acetate and pressed. The finished piece has the appearance of wood interspersed at regular intervals with little windows either clear or in color.

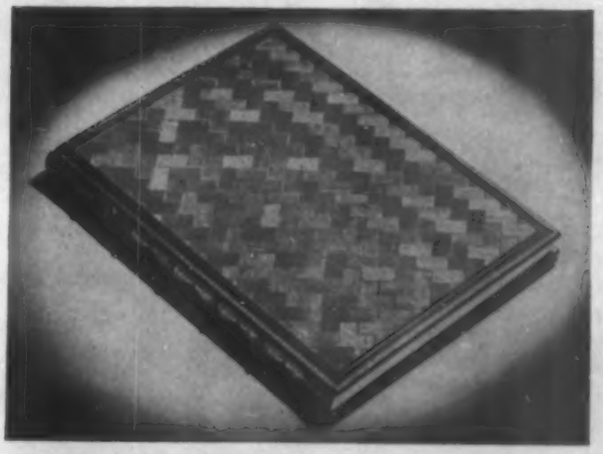
With such an unlimited variety of pattern, color and material from which it can be fashioned, this woven and laminated product seems destined to find favor for many diversified applications. It provides architects and designers for the first time with decorative wood which can be curved at any reasonable radii. This means that rounding surfaces such as the approach to recessed doorways or even pillars and columns can be covered economically to produce a parquet effect.

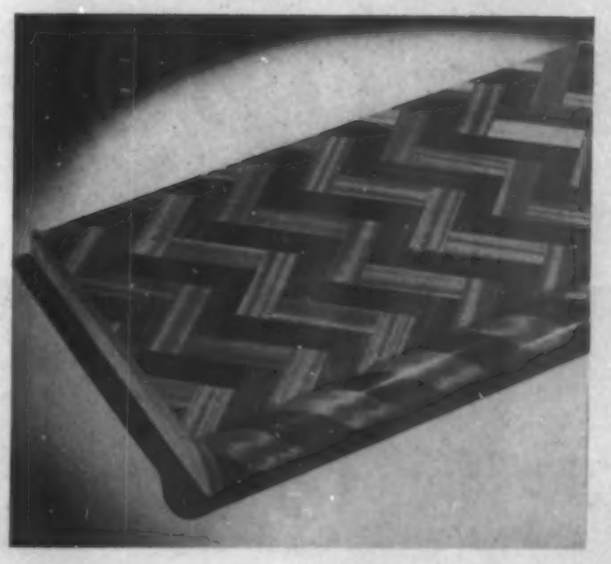
One of the first architects to appreciate its opportunities is J. Philip Kiesecker, noted marine architect who has already used plastics extensively in marine architecture and interiors. He predicts a brilliant future for this laminated version of woven veneers, in many fields.

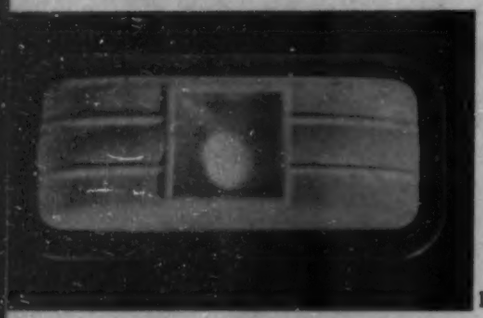
"This material," he says, "can be applied to table tops which are elaborate enough to be treated in marquetry, and the designer may specify practically any composition he may wish to dictate. When so used, it will have a wear-resisting surface, due to its plastic face, which is almost indestructible, and one which can be cleaned often and easily with ordinary soap and water. There is also a demand for a great quantity of serviceable tables, such as those used in cafes, night clubs and restaurants, which in many instances have been provided with a laminated veneer. Owing to the novel appearance of this new material, which has exactly the same surface and wearing qualities, it should find wide acceptance in this field. On more refined pieces of furniture, if the design warrants, panels can be similarly produced, enabling the designer to create any desired degree of elaboration without being faced with the problem of excessive weight or cost.

"Laminated veneers will also be found beneficial in the commercial field, particularly for doors, which are turned out in large quantities by mills specializing in this work. It provides a medium for producing beautiful and interesting surfaces in higher grade doors, especially as the present trend is (*Please turn to page 66*)

On the opposite page, is a canoe surfaced with Parkwood, a woven veneer laminated with cellulose acetate sheet. At the left, on this page, is a lampshade of Parklite, a similar material in which transparent squares appear. Below, is an atlas with woven veneer panels produced by Harcourt Bindery. At the bottom, is a bar top which illustrates the use of the material in curved surfaces







1. This bus light has a Beetle diffusor molded by Waterbury Button Co. for Miller Co. which combines happily with an aluminum frame. Complete weight 12.1 oz.

●

2. To keep cafeteria coffee from splashing in the saucer, and to keep it warm, the Colonnade Cafeterias have provided a Durez cover molded by Northern Industrial Chemical Co. Repeated washing and sterilizing has no damaging effect

●

3. The new Plastique Lektrolite so widely proclaimed in Esquire and other magazines has a Plaskon case molded by Bridgeport Molded Products Inc. for the Progress Corp. The Lektrolite lights without flame, simply flip open the cover, insert your cigaret and puff. Weighs next to nothing, will last forever

●

4. This portable electrocardiograf (heart action readings) has a new plastic case molded of Durez by Northern Industrial Chemical Co. Because the readings are taken photographically the case must be absolutely light tight and resistant to rough usage. It weighs twenty-seven lbs. and operates independently of wet batteries or connections with outside current

●

5. Dorothy Gray is packaging her cream concentrate in a glass jar with a Lucite top. Gold foil is used as background for the transparent material and color is applied to the molded in flower to make an effective container. Molded for Dorothy Gray by Mack Molding Co.

●

6. Swan Ink container designed especially for traveling precludes any possibility of spilling the ink because the bottle is held firmly in the container by a spring. This spring also prevents the glass bottle being broken by shock because it's practically afloat inside the container

●

7. Catalin door knobs and bar lever handles are ideal for bedrooms, baths and kitchens in the modern home where color note is introduced and where fittings are required to match. Reading Hardware Corp. provides those illustrated here

●

8. "Brushkomb" is injection molded of Lumarith for Major C. J. H. Mackenzie Kennedy by Celluloid Corp. The comb fits tightly into the grooved brush and both fit into a compact case. Easy to carry and use

●

9. The Atlas Appliance Company introduced a combination reading lamp and desk set which contains two penholders and compartments for clips and pins. Mottled walnut base, decorative ring and top knob molded of Bakelite by Accurate Molding Co., form a pleasing contrast with the bright metal upright and brown shade

●

10. This smartly decorative translucent polar bear was cut from a solid block of Prystal by C. K. Castaing. It illustrates the introduction of plastics into the field of sculpture by an interesting example

●

11. One of a new group of table radios with plastic cabinets, known as the Coloradio series is announced by Fada Radio and Electric Co. Beetle and Durez are the materials used. Associated Attleboro Mfrs. Inc. does the molding

●

12. Polaroid goggles for winter sports, manufactured by the American Optical Co., eliminate reflected glare from ice and snow, and protect the eyes from piercing wind

IN REVIEW

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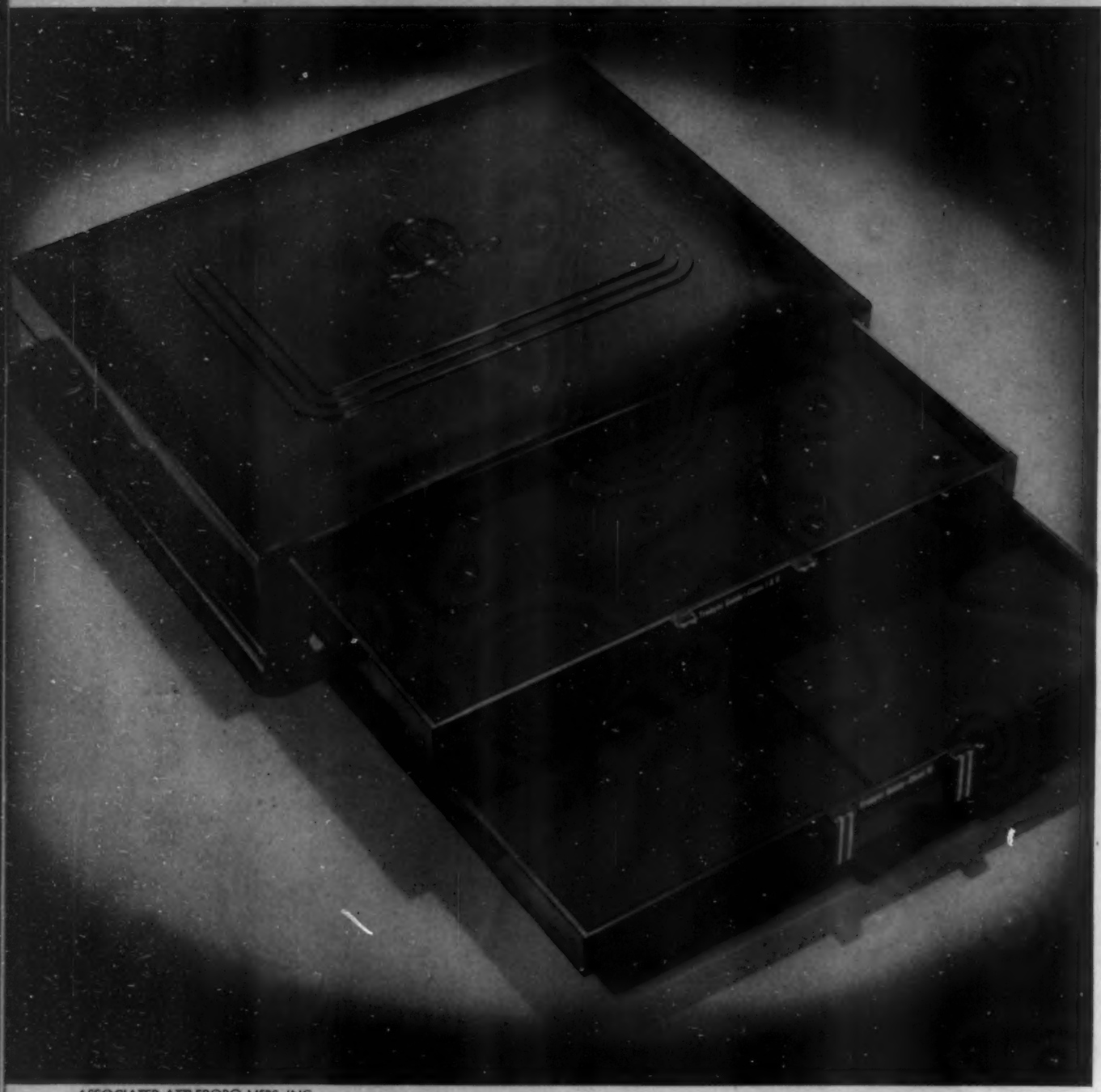


ASSOCIATED ATTLEBORO MFRS. INC.

THIS MOLDED CABINET INDICATES A TREND WE HAVE ADVOCATED for a long time. Of course cabinets and drawers have been molded before but not of these dimensions. 12 1/4 inches wide by 15 1/4 inches long and 4 inches deep, it has molded drawers 11 inches by 13 inches inside dimensions, 3/4 in. deep. The lower drawer unit is integral with the base while the top drawer unit forms the cover. These are fastened together with bolts at each corner and the cabinet is constructed so that as many drawer units as may be required can be added between. Net weight, 6 lbs. 2 ounces. Molded drawers neither swell nor shrink. No matter how many are produced they are all of identical dimensions, therefore, they operate freely in any climate under any conditions. Their surface is resistant to moisture and most cleaning agents. This cabinet is molded for The Dentists Supply Co. and used by dentists for assortments of artificial teeth, dental wax and Trubyte guides.

STOCK MOLDS

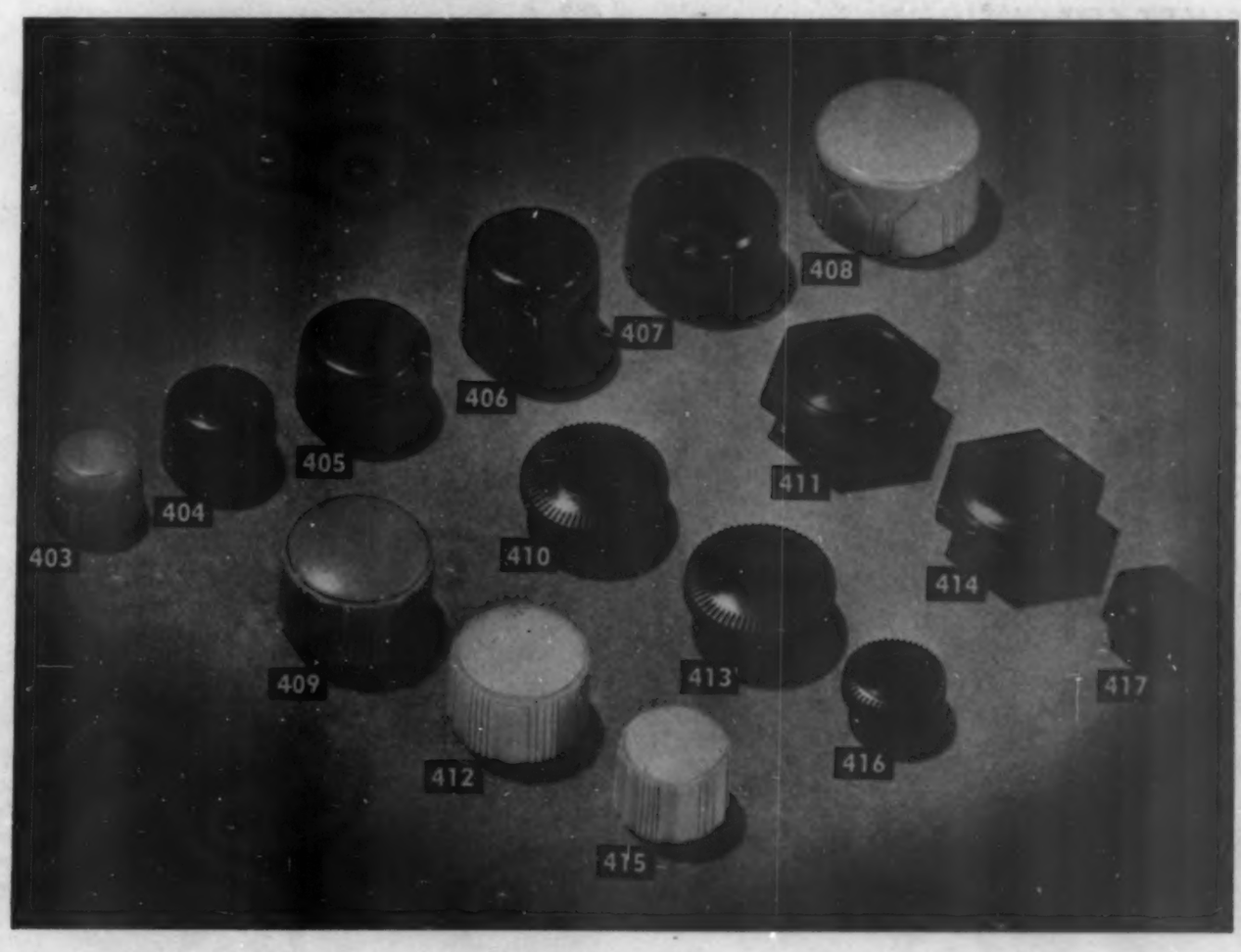
SHEET FORTY-SEVEN

These closures are available from stock molds in any color or material desired. Samples will be gladly sent from the manufacturer to interested executives if they will write their inquiry on company letterheads specifying sheet and item numbers

---

403. Small threaded cap with decorated sides. Inside diameter 3/8 in. 5/16 in. high
404. 1/2 in. inside diameter. 3/8 in. high
405. 5/8 in. diameter inside. 7/16 in. high
406. 11/16 in. inside diameter. 11/16 in. high
407. 1 1/16 in. inside diameter. 1/2 in. high
408. 11/16 in. inside diameter. 7/16 in. high
409. Octagonal cap with ribbed sides. 9/16 in. inside diameter, 7/16 in. high
410. Round tube closure with milled edge. 3/8 in. diameter inside and 5/16 in. overall height
411. Hexagonal cap with milled edge. 9/16 in. inside diameter. 5/16 in. high
412. Octagonal cap with ribbed sides. 1/2 in. inside diameter and 3/8 in. high
413. Round tube closure with milled edge. 5/16 in. diameter inside and 1/4 in. high
414. Hexagonal cap with milled edge. 7/16 in. inside diameter and 9/32 in. high
415. Same as 412, 3/8 in. diameter and 3/8 in. high
416. Same as 413, 1/4 in. inside diameter and 7/32 in. high
417. Same as 414, 5/16 in. inside diameter and 3/16 in. high

Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.



STOCK MOLDS

SHEET FORTY-EIGHT

511. Triple cosmetic container with separate jars and covers which set into a molded urea frame on a phenolic base. The assembled container, pictured upper left, may be printed or stamped with any brand name

503. Cold cream jar 2 3/4 in. in diameter, 2 3/8 in. deep inside. Holds 8 oz. and is 2 7/8 in. high overall

504. 4 oz. jar, 2 1/8 in. in diameter. 2 1/16 in. deep inside. 2 1/2 in. high overall

505. Jar molded in two colors cemented together. 2 13/16 in. in diameter, 1 5/16 in. deep inside. Overall 1 7/8 in.

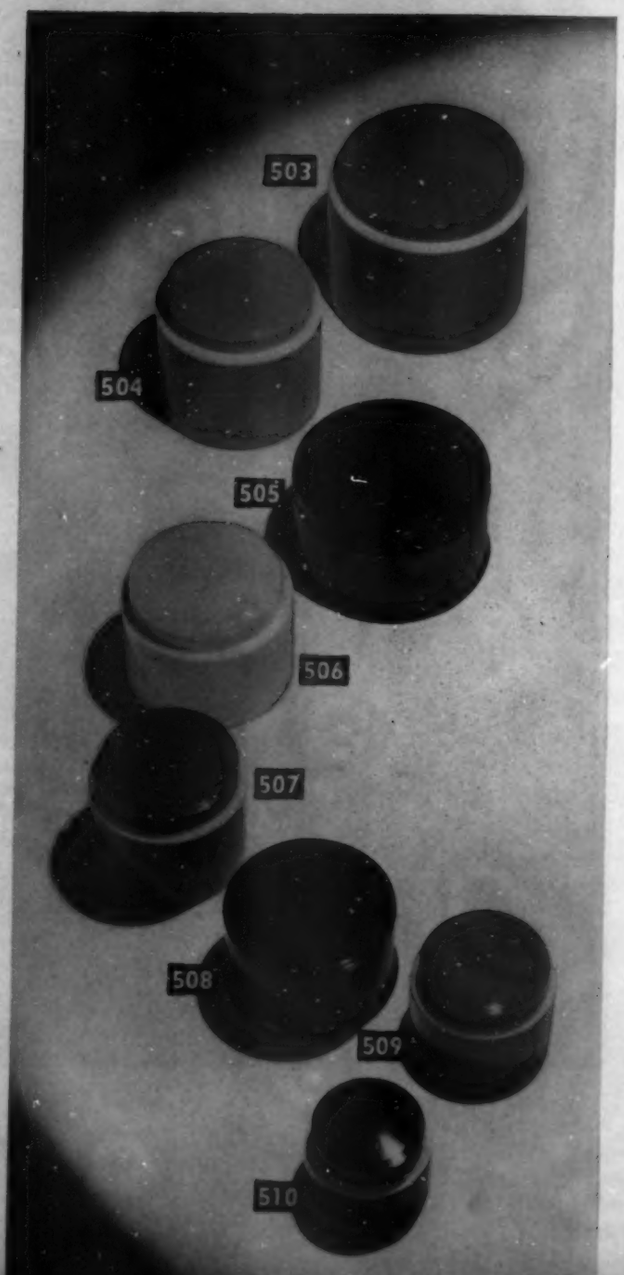
506. 3 oz. container. 2 in. in diameter, 1 3/4 in. deep inside. Overall 2 1/4 inches

507. 1 3/4 in. diameter, 1 5/8 in. deep. Overall 2 1/16 in. Holds 2 oz.

508. Same as 505 in one color. 2 1/8 in. diameter, 1 in. high. Overall 1 1/2 in.

509. 1 oz. jar, 1 1/2 in. in diameter. 1 1/16 in. high. 1 1/2 in. overall

510. 1/2 oz. jar. 1 3/16 in. in diameter. 7/8 in. deep. 1 1/4 in. overall



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PREHEATING THERMOSETTING MOLDING MATERIALS

by D. M. BUCHANAN*

THERMOSETTING MOLDING MATERIALS ARE often conditioned by heating them prior to charging the molds. Such conditioning has become known as "preheating." There are so many processes and adjustments which the molding industry is called upon to make that one might well ask, "Why, preheat?" In answering this question we have to assume standardized conditions that are more or less ideal. For example, we assume that the material is preheated at temperatures between 82°C. (180°F.) and 105°C. (219°F.) for thirty minutes. Under these conditions there are several advantages to be gained by preheating.

1. The closing time of the press is reduced by preheating. For example, on a large loving cup base 75 seconds were necessary to close the press. Under identical conditions with preheated material the press was closed in 30 seconds.

2. Molding cycles are reduced. This is a result of lessening the closing time and also reducing the length of time that is necessary to cure a piece until blisters are eliminated. For example, the loving cup base referred to above required 6 minutes to cure under ordinary conditions. When preheated material was used, good bases were produced in $4^1/_2$ minutes.

The reason for reducing the cycle is that molding materials in their pre-fabricated state are very poor conductors of heat. It is reasonable to assume that most of the curing time is taken in raising the temperature of the material. By preheating, the material gets up to temperature quicker because it has been given a head start.

3. All electrical properties are improved. For example, dielectric strength of a test specimen molded in the ordinary way was 300 volts per mil. When the

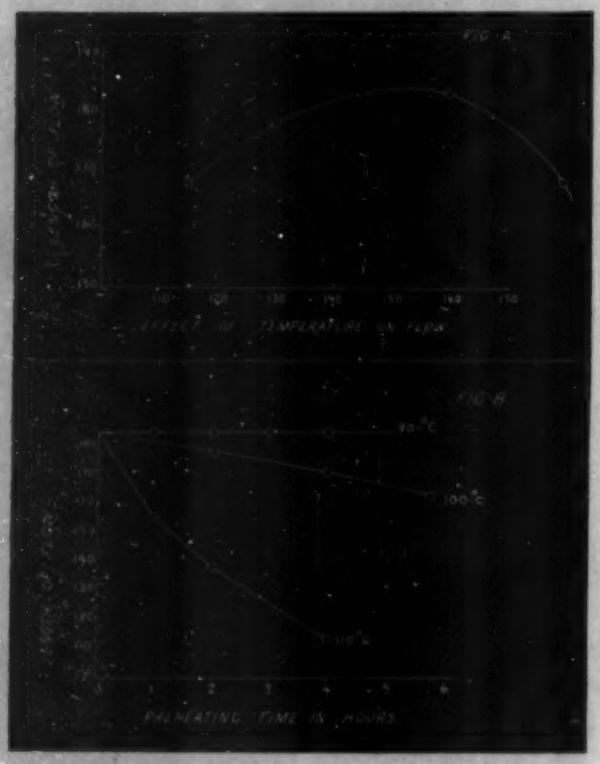
* Bakelite Corporation

1

Cup-type preheater equipped with steam coils or thermostatically controlled electric space heaters. Cups hold predetermined weight charge and can be rotated with press cycle to provide proper length of heating time

2

Oven type preheater (steam coils) with perforated metal drawers for heating preformed materials



powder charge was preheated, dielectric strength became 375 volts per mil. Resistivity was improved tenfold. Power factor and dielectric constant were reduced, resulting in a loss factor one-third of that ordinarily obtained with cold material.

4. Appearance is improved. For example, any tendency toward color segregation or orange peel is reduced.

5. Ordinarily, a harder material can be used and molded. For example, on one job, a special material of extremely high plasticity was necessary. This material brought a premium price. When preheating was resorted to, a low-priced, general-purpose material of ordinary soft flow was used successfully.

6. Greater uniformity of production is obtained, resulting in more uniform dimensions. This is due to the fact that where preheating is done properly, the powder is loaded into the mold at all times at nearly the same temperature. On the other hand, the temperature of the powder charge entering the mold will vary, depending upon the temperature of the room and outside condition. Further, most molding materials are in powder form. Such powder will absorb water readily in a humid atmosphere if not carefully protected. Proper preheating dries this absorbed moisture.

7. Heat resistance is improved, considering the maximum temperature a part will withstand without blistering as a measure of heat resistance. For example, on one job, parts molded in the regular way blistered at 204°C. (400°F.). When the material was preheated, the parts withstood 210°C. (410°F.) for the test period of two hours without blistering. You will note in pointing out the advantages of preheating the material prior to charging the mold that the treatment of the material not only results in economy of production but also in improved quality.

One is naturally suspicious of such a remarkable accomplishment, so we ask ourselves what are the disadvantages. Unless careful control of preheating condition is maintained, the material is likely to be "precured." This results in the following:

a. Material fails to flow out.
b. Appearance is exceptionally dull.
c. Parts are non-uniform in both electrical and mechanical properties.
d. Shrinkages vary widely.
e. Parts are apt to be very brittle: for example—in one plant where preheating was improperly done, in the assembly operation, the percentage of chipped parts was increased by 300 percent.

How can one insure against the disadvantages resulting from improper preheating condition? Temperature is the most important factor. It is not sufficient to assume because the thermometer or instrument reads a given temperature on an oven that the material is actually at that temperature. Such readings must be checked by thermometers in the material itself. It is a corollary in the plastics industry that flow of thermosetting materials varies widely with the molding temperature. It is advisable to determine flow characteristics of a given material at various temperatures to choose proper temperature for preheating. For example, Fig. A shows the effect of temperature on flow of a particular type of material. Note: the maximum flow is obtained between 140°C. (284°F.) and 150°C. (302°F.). Above that temperature distance of flow is decreased. Fig. B shows the effect of preheating at various temperatures for different periods of time on the flow of the same material. You will note that (*Please turn to page 60*)

SAFETY GLASS

by J. M. DeBELL and J. DAHLE*

THE HISTORY OF PLASTICS FOR SAFETY GLASS furnishes a good illustration both of the contributions that are made to the comfort and safety of the community by modern chemical developments and of the kaleidoscopic speed with which the plastics and synthetic resin industry is evolving under present-day industrial research: within ten years two different plastics have attained widespread commercial use, and a third is now in the offing. Several excellent summaries covering safety glass plastic and the advantages of particular resins have duly appeared in the literature.[1] These trace safety glass from its original conception in 1906 by John Crewe Wood who assembled two sheets of glass and one sheet of cellulose nitrate with tolu balsam adhesive; through the significant work of Edouard Benedictus, who in 1914 obtained his patent[2] under which a softer cellulose nitrate plastic was actually molded by heat and pressure between the glass sheets; up to the present highly specialized methods and successful results obtained by the major producers of today.

The reasons for safety glass in the motor car industry are obvious: before its introduction, two out of three personal injuries in automobile accidents resulted from glass breakage.[12] Furthermore, these accidents were particularly unfortunate on account of the large number of fatalities and the frightful permanent disfigurements which resulted from the jagged glass. As soon, therefore, as a reasonably acceptable technical product was available, its adoption followed rapidly; and today the bulk of the world's automobile production is provided with this form of protection and State legislation requires the use of safety glass in the cars enjoyed by over seventy-five percent of the United States.

The history of the plastic itself is divided into three phases: (1st) the original nitrocellulose plastic; (2nd) the use of cellulose acetate plastic; and (3rd) the application of manifold types of synthetic resins. The original nitrocellulose plastic possessed the basic essential characteristics of toughness, reasonable clarity and susceptibility to adhesion. The pioneer work utilized an orthodox nitrocellulose-camphor plastic, softened in solvent, and then molded between the glass in hydraulic presses under heat. This safety glass in service developed numerous defects: the nitrate itself tended to be unstable so that it discolored, gradually lost viscosity, and hence toughness; use of adhesive was found necessary; and after a time the volatile solvents either escaped, caused bubbles or else became homogeneously diffused through the plastic sheet so that adhesion was lost. If larger quantities of low boiling solvents were used the adhesion defect was cured but the others were enhanced. Besides, the heat resistance and the cold impact were none too good as judged by present-day standards. The plastic was manufactured in sheets and supplied as such. The cost was necessarily high, the wastage was enormous, and the poor aging caused considerable discontent among users, stimulating further research. To be sure, numerous improvements were made; for example, the amount of volatile solvents was decreased; various adjustments were made in the composition of the plastic, and the nitrocellulose base itself was improved somewhat in stability and clarity.

Meanwhile, the art of assembly had made considerable progress and the autoclave method of pressing,[3] was introduced. The standard method of manufacture settled down to the following steps: washing the glass, cutting the plastic to shape, applying adhesive to the glass, assembling the three major elements—two glass sheets and the plastic sheet, pre-pressing lightly to prevent slippage of glass from the plastic and autoclaving under diethylene glycol or petroleum oils at 250 to 300 deg. F. and approximately 150 pounds per square inch pressure.

It had long been recognized that the stability characteristics of cellulose acetate were far superior to the nitrocellulose in use; but advances were delayed because of the high cost of the basic material, the difficulties of adhesion and the absence of suitably economic methods of production of the plastic. With the rise of acetate rayon, and the consequent lowering of price of acetic anhydride and the cellulose acetate derived therefrom, the first objection disappeared.

Adhesion was a more difficult problem. One of the authors,[4] in filling what is believed to be the first cellulose acetate safety glass order (for the Empire State Building in 1930), used the expedient of treating the plastic with weak caustic soda to improve its adhesive characteristics, but later appropriate changes in the composition of the plastic and the development of new cementing agents made special precautions unnecessary. Another means of securing good adhesion was the use of a thin film of polyvinyl acetate or similar materials on the surface of the plastic.[5] Large scale economic production of acetate plastics dated from 1932 before which engineers had devised means for the continuous production of uniform gage continuous cellulose ester plastic.[6] Acetate plastic is furnished in rolls of .025 in. thickness, up to 50 in. in width and over a half mile in length. The thickness of sheets is held within a variation of less than .001 in. across its entire width. This product has become standard (*Please turn to page 62*)

*Fiberloid Corporation

MOLDS FOR PHENOL RESINOIDS

by T. E. CASSEY*

Third installment continued from our December issue and reprinted by permission from August 1937 issue Journal of The American Society of Naval Engineers

Flash subcavity molds

THE SUBCAVITY MOLD AS INDICATED BY ITS name is a form of mold (multi-cavity) which has a common loading chamber for all cavities, the cavities being located in the bottom of the mold. The common loading chamber is of sufficient depth to accommodate the multiple charge. This use of a single bulk charge obviates the necessity of separate weighing of the material for each cavity, as is required for all the other types of molds. In this type of mold the force bottoms directly on the metal land surface, forcing the molding material into the several subcavities.

The flash or land area should be kept to a minimum within the limits of design, by proper staggering of the cavities, and should not exceed one-half the cavity area. Subcavity molds may be flash or positive molds, but are generally positive type.

This type of mold should be restricted to the production of thin simple pieces of small size (not over one inch in diameter), when the material to be molded cannot readily be preformed, and when the plasticity of the molding material is very high, the electrical and physical requirements for the finished parts are very moderate, and the factor of cost is of major importance.

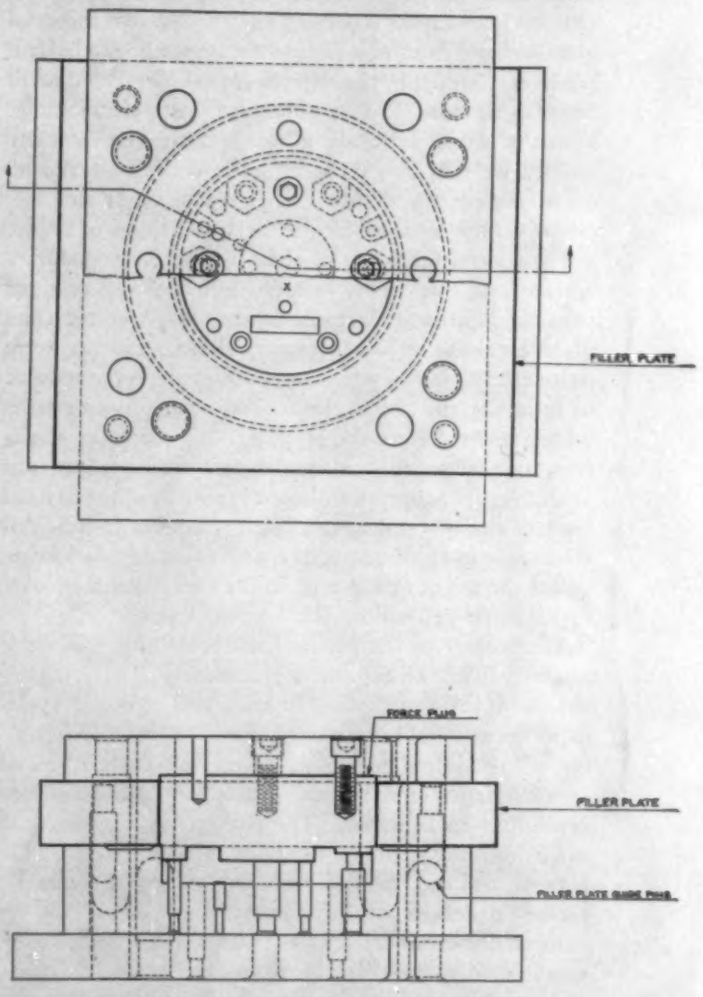
The flash subcavity type of mold has no particular application in the production of pieces for Naval installations, although there have been molds of this type used.

Flash filler plate molds

The flash filler-plate mold is not a basic type in itself, but is a variation of the loading principle of the "flash overflow" type of mold, usually multi-cavity. Its name is derived from the special loading principle involved, wherein a spacer or filler plate provided with the necessary apertures immediately above and in line with the molding cavities is used for the purpose of providing necessary filling space for the raw material and wherein such necessary space is not formed as an integral part of the chase. By this filler plate, the raw material is confined in position over the cavities during the initial period of the molding operation. Either powder material or preforms may be used.

The particular advantage of the filler-plate type of mold is that it provides a means of reducing the height of the chase from what would be required if the mold was of other type. This not only reduces the cost of the mold, but of more importance, facilitates the placing of inserts in the cavities, and reduces the probabilities of breakage of the insert holding or hole forming pins.

In the application of the filler plate to the flash mold, the mold is loaded with the filler plate in contact with the flash ridge. As the force plug descends, the filler plate confines the material between the cavity and the force plug, excess material escaping over the flash ridge.



UNIT CONSTRUCTION, INDIRECT HEATED, HAND, SINGLE CAVITY, FLASH OVERFLOW, FILLER PLATE, COMPLETE CLOSURE, KNOCKOUT PLATE EJECTING MOLD.
FIG. III

Figure 3 shows the arrangement of a Flash Overflow, Filler Plate mold; Complete Closure, Knockout Plate, Bulk Material; also Indirect Heated, Hand, Single

* Chief Electrical Draftsman of the Bureau of Engineering, Navy Dept.

Disston saw handles injection-molded of Tenite by Mack Molding Company

TENITE—*first choice for saw handles*

A SAW HANDLE molded of plastic material is unique. It will catch and hold the attention of every workman "looking at saws." Thus Disston's new "Masterpiece" saws with Tenite handles are sure to get special consideration.

But Disston didn't select Tenite for its eye appeal only. As Disston's mailing folder says, the new handles are made of the "toughest, strongest molded material ever developed for practical industrial purposes. Perfect in feel. Will not chip, shrink or swell . . . Blade can never work loose . . . 'Hang' and balance are always right."

Hardly a day passes without Tenite finding a new unusual job—doing it so well that some product has a striking sales advantage. Tenite has qualities widely sought in industry and never before combined in one raw material. It can be formed into finished articles at the fastest speeds ever attained in plastic molding.

• • •

Tenite is a tough, practically unbreakable plastic made of Eastman cellulose acetate—in every color, plain, variegated, transparent, opaque. A 52-page illustrated book on Tenite and its uses will be sent you on request.

TENITE REPRESENTATIVES: New York: 10 East 40th St.; Chicago: 2264 Builders Bldg.; Detroit: 914 Stephenson Bldg.; Leominster, Mass.: 25 Merriam Ave.; Pac. Coast: W. & G. Meyer & Co., San Francisco: Federal Reserve Bldg.; Los Angeles: 2461 Hunter St.; Seattle: 710 Belmont Pl.

TENNESSEE EASTMAN CORPORATION, KINGSPORT, TENN., Subsidiary of Eastman Kodak Company

Cavity. The construction of this mold is basically the same as the Flash Overflow mold delineated in Figure 1, with the addition of the filler plate which is placed between the chase and the force plate. It will be noted that in this design the force plug is lengthened sufficiently to pass completely through the filler plate in its travel to contact with the chase. In this mold the force plug is recessed in the force plate $^1/_8$ inch, differing from the flash overflow mold in this respect. The force plug also contacts with the flash ridge, as the force plate is separated from the chase the distance of the filler plate thickness. The filler plate has an individual set of guide pins which holds the plate in proper position, independent of the action of the force plate.

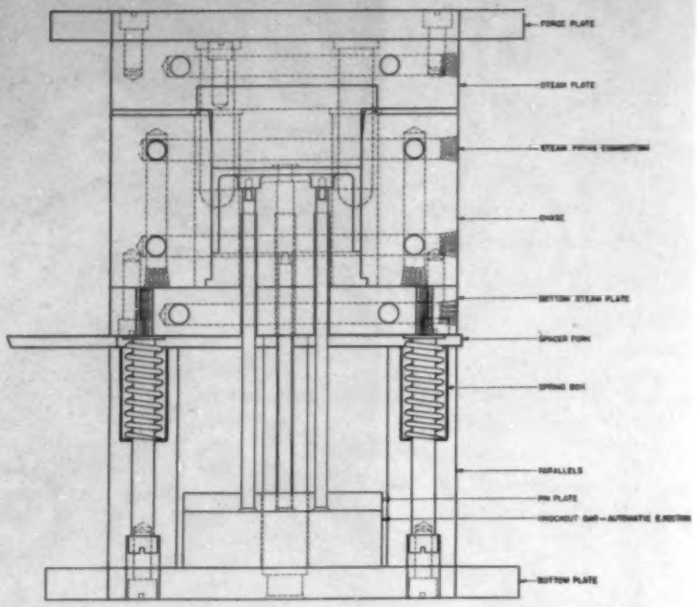
Molds of the flash filler plate classification have been furnished having the forms of "Spacer Fork" and "Spring Box" listed under the "Closure" classification. These particular molds are designed for the use of C. F. I. (cellulose filler, best impact strength) material which is contrary to a previous statement made in the foregoing that flash molds are not suitable for use with fabric base high impact materials. However, this is just another instance of what may be expected in matters concerned with the molding of phenolic resinoids, where we find that any definite rule of procedure that may be attempted will resolve itself into a rule to be broken in specific cases.

The purpose of the spacer fork and the spring box is to provide an intermediate closure position for the mold where the positioning of inserts held by relatively long insert holding pins is involved, and where the lateral pressures upon the insert holding pins is liable to distort or fracture these pins. The spacer fork, as its name implies, is a fork of suitable thickness and strength which is inserted between the bottom plate and the chase to limit the initial closure of the mold a predetermined amount. This procedure holds the inserts in a position within the holes in the force plug where they are protected from the initial pressures and flow of the raw material. After sufficient time elapses for the material to complete its initial flow, the spacer fork is withdrawn and the mold completes its closure, forcing the inserts into their proper position in the polymerizing material.

The spacer fork may be used alone or in conjunction with the spring box. The spring box provides a means of automatically forcing the chase and bottom plate apart, to provide the necessary opening for removal of the spacer fork, when the pressure is released and the top force is opening the mold. This type of construction relieves the press operator from the necessity of manually parting the mold, thus leaving his hands free to remove the spacer fork.

The arrangement of a mold having spring box and spacer fork features is shown in Figure 7.

For naval production, the flash filler plate mold has had quite a wide application. There are now in active use flash, filler plate type molds for producing possibly twenty-five Navy standard designs of molded pieces; of this number, seven are single cavity hand type, five are single cavity, semi-automatic type and the remainder



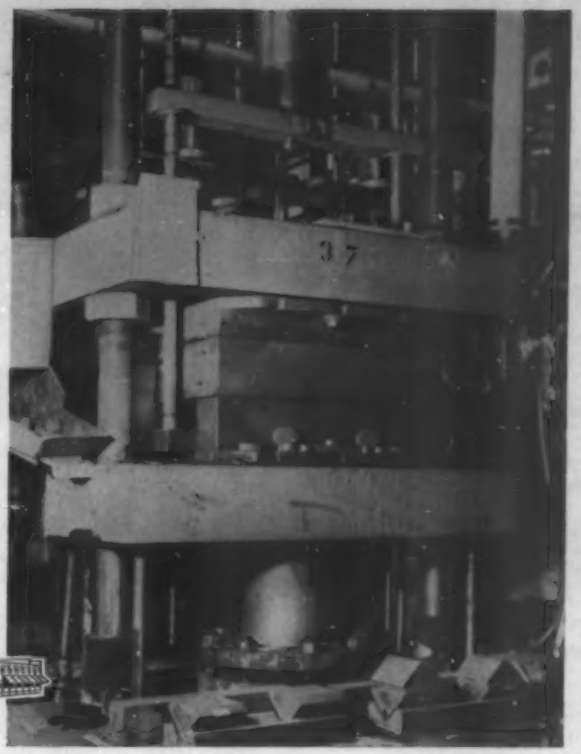
BUILT UP CONSTRUCTION, DIRECT HEATED, SEMI-AUTOMATIC, SINGLE CAVITY, TRULY POSITIVE, SPRING BOX AND SPACER FORK, AUTOMATIC EJECTING MOLD.
FIG. VII.

are multi-cavity, semi-automatic type. Under the latest ideas concerning the proper application of mold designs, six of the seven hand, flash filler plate applications are questionable and in event of purchase of replacements of these mold equipments in all probability would not be duplicated as such. These six hand mold applications are designed for C. F. I. material and although the molds can be operated, difficulties have been experienced with them. Their chief interest lies in the fact that they represent an effort in the recent transitory stage of mold designing to lead away from the known limitations of the truly positive mold for Navy work. The single cavity, semi-automatic molds of this group are quite heavy (weighing from 200 to 300 pounds each) for handling and shipment by the custodian Navy Yard, and although they can be operated satisfactorily, it has been demonstrated that sufficient production with greater ease of handling and under better economic conditions is obtainable with the use of two or three 4-cavity hand molds.

Four of the semi-automatic, multi-cavity molds of this group fall in the same category as the single cavity molds referred to, except that the weights of these molds are excessive to the point of being prohibitive. One of these molds weighs 750 pounds and another, 400 pounds, making handling, shipment and inspection an extremely difficult matter. Unless other considerations enter into the matter, attempt should be made to limit the weights of Government-owned molds to a figure—possibly 20 pounds maximum, so that the handling of the mold will not become an economic difficulty.

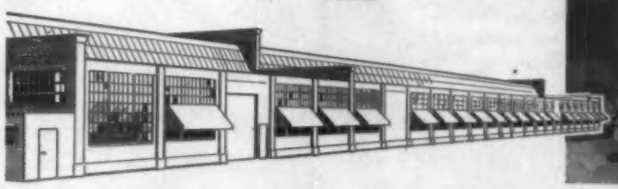
There are eight semi-automatic, multi-cavity molds in this group which are of a particular construction, developed to meet a certain production for receptacle plug tips. This application, although contrary to some accepted ideas for mold applica- (*Please turn to page 62*)

G. E. puts the pressure on us . . . to put pressure on plastics



Closeup of one of the High Speed Molding Presses.

Part of the new G. E. molding plant, Pittsfield, Massachusetts.



THEIR new High Speed Presses required leather packings that could withstand heat, pressure and the steady pounding of 24-hour operation — and Graton & Knight Leather Packings are highly satisfactory. These packings range in size all the way from 1½" cup to 43½" U. G & K engineers go into a plant like this, study the packing requirements, make up their own specifications, present them to the manufacturer. After that, whenever he needs *a* packing, or hundreds of them — he can order by *number* the correct packing for each job.

Here's what Graton & Knight can do for you

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PLASTICS DIGEST

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastic materials or use them

General

TREND OF RESEARCH IN PLASTIC MATERIAL. G. Morgan. British Plastics *9*, 311–13 (Nov. 1937). As examples of important British technical advances, the speaker mentioned transparent aminoplastics, extended use of transparent methacrylates, and use of extrusion technique in the manufacture of tubes, rods, and beading from phenolic plastics. Awakening interest in the subject of resinification as an academic study and some results of such work were discussed.

ART IN PLASTICS DESIGN. R. J. Hill. Mech. Eng. *59*, 914–16 (Dec. 1937). It is suggested that molded plastics should bear the mark of the artist rather than the form and decoration evidencing their machine origin.

PLASTICS MATERIALS. H. Burrell. Mech. Eng. *59*, 917–22 (Dec. 1937). A review.

CRACKPROOF, EVER-PLASTIC CAULKING COMPOUNDS. Sci. Am. *157*, 295 (Nov. 1937). The Ever-Plastics Corporation describes the development of compounds based upon a plastic carrier in combination with an adhesive resin and asbestos and mineral fillers which are nondrying, fume-proof, germicidal, and water-tight, and will adhere to damp surfaces.

LUBRICANT FOR LAMINATED PLASTIC GEARS. E. Thiessen. Kunststoffe *27*, 290–5 (Nov. 1937). Water, greases, and oils, and grease-water and oil-water mixtures were examined as lubricants for plastic gears. Water was not considered as satisfactory.

Materials and manufacture

GLYPTAL RESINS. G. Wright. Rev. Gén. Mat. Plastiques *13*, 263–5 (Sept. 1937). In molding glyceryl-phthalate resins, a means of escape for volatile products must be provided. The properties of these resins and their potential applications are discussed.

TRANSPARENT FILMS FROM MARINE ALGAE. J. Pehorey. Rev. Gén. Mat. Plastiques *13*, 270–4 (Sept. 1937). The extraction of algin and its conversion into transparent films are described.

BUTADIENE RUBBER. Y. Mayor. Rev. Gén. Mat. Plastiques *13*, 275–8 (Sept. 1937). A review. Not complete in this one issue.

THE PROPERTIES OF CHLORINATED RUBBER. J. P. Baxter and J. G. Moore. Chem. Age (London) *37*, 407–8 (Nov. 20, 1937). A brief discussion of the general stability and chemical resistance of chlorinated rubber in film form and as a molded plastic.

THERMOPLASTIC MATERIALS. Brit. Plastics *9*, 283–7 (Nov. 1937). A review of the properties and applications of styrol and vinyl chloride resins and a plastic of the "synthetic rubber" type.

Molds and molding

DESIGN PROBLEMS OF MOLDED PLASTIC PARTS. D. M. Buchanan. Mech. Eng. *59*, 907–13 (Dec. 1937). Fundamental factors to be considered in designing parts to be molded are wall thicknesses, allowances and tolerances, inserts and fastenings, threads, fillets, knurling, lettering and engraving, and finish. These are discussed in detail.

Applications

SYNTHETIC RESINS IN AIRCRAFT CONSTRUCTION. R. Hamard. L'Aéronautique *19*, 231–5 (Oct. 1937). The use of resins in impregnated pressed wood and cord-reinforced plastics for the fabrication of aircraft is reviewed.

PLASTICS IN THE AIRCRAFT INDUSTRY. G. P. Young. Iron Age *140*, 118 (Oct. 28, 1937).

PLASTICS IN THE AUTOMOBILE INDUSTRY. G. D. Clease. Brit. Plastics *9*, 280–1 (Nov. 1937). The author suggests that if a certain amount of standardization can be accomplished in motor car design, the possible applications of plastic molding compositions in this field would be vastly increased. He points out that there already exists some uniformity of parts which permits the use of steel pressings, entailing high die costs, by manufacturers with small outputs.

DENTURE PLASTICS. R. N. Johnson. Chem. and Ind. *56*, 1040–5 (Nov. 20, 1937). The history of the development of dentures is reviewed. Essential requirements for this use include absence of warpage or shrinking, color stability, and good adhesion to porcelain and metals.

NEW PLASTIC MATERIALS FOR RADIO CABINETS. H. Chase. Electronics *10*, 26–30 (Nov. 1937). A survey of plastics used in cabinets and external fittings of radio sets. The pros and cons of plastics versus wood or metal for these products are discussed.

Testing

DIRECTIONS FOR STUDY OF HARD COMPOSITE DIELECTRICS. J. Inst. Elec. Engineers *81*, 553–64 (Oct. 1937). A report of the British Electrical and Allied Industries Research Association describing methods for the determination of volume resistivity, surface resistivity, electric strength, power factor and permittivity, tensile strength, cross-breaking strength, resistance to crushing, impact strength, plastic yield, accelerated aging, density, water absorption, and machining properties.

Synthetic coatings

IMPORTANCE OF VINYL POLYMERS IN THE COATING INDUSTRY. H. Prillwitz. Kunststoffe *27*, 295–7 (Nov. 1937). Review of the use of polyvinyl acetates and chlorides, polyacrylates, and polystyrols as coatings and adhesives.

COAL TAR SOLVENTS FROM PETROLEUM. E. H. McArdle. Chem. and Met. Eng. *44*, 598–601 (Oct. 1937). A discussion of advances in synthetic resins and protective coatings as related to the development of high solvency naphthas.

Chemistry

COLLOIDAL CONSIDERATIONS IN FILM FORMATION OF ORGANIC COATINGS. W. E. Wornum. Chem. and Ind. *56*, 995–7 (Nov. 6, 1937). Theoretical consideration of the physical aspects of film production from the standpoint of the physical unit taking part in the gel or film formation, namely, (1) molecular, (2) micellar, and (3) flocculate or micellar aggregate.

SOLUBILITY PROPERTIES OF CERTAIN HIGHLY POLYMERIC SUBSTANCES. W. Coltof. J. Soc. Chem. Ind. *56*, 363T–75T (Oct. 1937). The author considers dissolution phenomena observed with various highly polymeric substances as being caused by three different actions, viz., dispersion, swelling, and ballast (tending to counteract dispersion). The effect of the solvent molecule or mixed solvent molecules is the result of the specific actions of the various groups which actions are dependent upon the temperature.

RESEARCHES ON RUBBER AND RUBBER-LIKE SUBSTANCES. K. H. Meyer. Chem. and Ind. *56*, 1028 (Nov. 13, 1937). Theoretical review.

STRUCTURE OF CELLULOSE. H. DeW. SMITH. Ind. and Eng. Chem. *29*, 1081–4 (Sept. 1937).

INVESTIGATION OF PHENOL AND CRESOL RESINS. F. Seebach. Kunststoffe *27*, 287–90 (Nov. 1937). Crystalline intermediate products were identified and were detected in the resinous end product.

EXAMINATION OF SYNTHETIC RESINS BY X-RAYS. N. J. L. Megson and W. A. Wood. Nature *140*, 642 (Oct. 9, 1937). X-ray studies suggest that the resin from p-cresol monoalcohol is formed by small irregular displacements of the molecules from the crystalline formation and not by radical rearrangements of a random nature.

DURITE is the choice of Consolidated Molded Products Corp. when called upon to mold not only boxes shown on this page, but other more intricate requirements.

Unusual and particularly efficient hinges shown on some of these boxes are patented by the Rathbun Molding Corp.

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U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

ALKYD RESINS. Rowland Hill and E. E. Walker (to Imperial Chemical Industries Ltd.). U. S. 2,098,964, Nov. 16. An alkyd resin which becomes infusible when heated is made from a monoester of a polybasic acid by condensation with a mixture of polyhydric alcohols of which one is dihydric.

FLEXIBLE ARTICLES. G. B. Bradshaw (to E. I. du Pont de Nemours and Co.). U. S. 2,099,047, Nov. 16. Treating a metal base with an interpolymer of a methacrylate ester and styrene or a derivative thereof such as divinylbenzene, vinylbenzonitrile or styrene having an ester or ketone substituent.

SAFETY GLASS. J. S. Tinsley (to Hercules Powder Co.). U. S. 2,099,086, Nov. 16. An optically clear plastic for safety glass interlayers is made by hydrolyzing a mixed ester of cellulose in presence of one of the acids of the mixed ester.

HYDROCARBON RESINS. Wm. L. Webb (to Standard Oil Co.). U. S. 2,099,090, Nov. 16. Polymerizing a mixture of an iso-olefin with other olefins in presence of a metal halide catalyst at a temperature at which only the iso-olefin polymerizes, then deactivating the catalyst by chilling (below 0°F.)

PACKING. H. T. Stewart (to Garlock Packing Co.). U. S. 2,099,241 and 2,099,242, Nov. 16. A packing composition contains, in intimate admixture, asbestos, graphite, aluminum powder, lubricating oil and a dispersed compounded chloroprene polymer.

PHOTOGRAPHIC FILM. L. E. Clement (to Eastman Kodak Co.). U. S. 2,099,297, Nov. 16. A photosensitized layer is made of a polyvinyl resin and a halogen-liberating compound, the color of the polyvinyl compound being changed by the liberated halogen.

RUBBER DERIVATIVE. L. B. Sebrell (to Wingfoot Corp.). U. S. 2,099,318, Nov. 16. Making rubber conversion products by treating a rubber cement with tin tetrachloride at room temperature, removing tin from the compound by reduction, and drying in absence of air.

COLORED SHEETING. Wm. O. Kenyon and R. H. Van Dyke (to Eastman Kodak Co.). U. S. 2,099,341, Nov. 16. Moistureproof wrapping foils in colors are made by coating a cellulose acetate base sheet with a thin layer of a dyed cellulose ester of a dicarboxylic acid in which one carboxyl group remains free.

FILM SCRAP RECOVERY. M. J. Reid (to Eastman Kodak Co.). U. S. 2,099,347 and 2,099,348, Nov. 16. Recovering cellulose acetate film scrap by washing off the gelatin emulsion with warm water, then leaching the film with a mixture of a lower aliphatic alcohol and acetone and washing out the leaching solution; or treating the scrap (after removing the gelatin emulsion) with hot very dilute aqueous alkali.

DIPENTENE RESIN. I. W. Humphrey (to Hercules Powder Co.). U. S. 2,099,486, Nov. 16. A varnish containing a resin made by treating a dipentene: maleic anhydride condensation product with an alcohol.

NITROCELLULOSE EMULSIONS. J. K. Speicher (to Hercules Powder Co.). U. S. 2,099,501, Nov. 16. An aqueous nitrocellulose emulsion which will dry to a clear film in high humidity atmospheres contains an added water-immiscible volatile organic solvent which is higher boiling than the lowest boiling solvent in the original nitrocellulose solution.

PHENOLPHTHALEIN RESIN. E. H. Bucy and Robt. Watkins (to Atlas Powder Co.). U. S. 2,099,510, Nov. 16. Condensing phenolphthalein with rosin in presence of a vegetable oil to make a clear resin.

RUBBER DERIVATIVE. H. R. Thies and G. R. Lyon (to Wingfoot Corp.). U. S. 2,099,546, Nov. 16. Making rubber condensation products by treating a rubber cement with a condensing agent, stopping the reaction and filtering the cement without removing from it the reaction product.

LACQUERS. J. D. Murray (to Murray Liquafilm Corp.). U. S. 2,099,570, Nov. 16. Heating a cellulose ester (xanthate, acetate, nitrate or phthalate) or ether (ethyl or benzyl cellulose) with castor, soy bean, cottonseed or maize oil or a paint oil such as tung, perilla or linseed oil, and blowing air through the mixture to make a coating composition.

PLASTIC. Ernst Helft (to "Unichem" Chemikalien Handels A.-G.). U. S. 2,099,651, Nov. 16. Plasticizing pigmented rubber compositions with an ester of a higher alcohol (8 to 30 carbon atoms) and a lower or higher aliphatic acid (1 to 30 carbon atoms).

CELLULOSE ACETATE. Robt. P. Roberts and E. B. Johnson (to Celanese Corp. of America). U. S. 2,099,753, Nov. 23. Ripening cellulose acetate by destroying excess acetylating agent in the acetylation system, allowing to stand for a time, neutralizing the acid catalyst and treating with a ripening agent until the product is acetone-soluble and has an acetyl content below 56%.

FORMAL ESTERS. Geo. W. Seymour (to Celanese Corp. of America). U. S. 2,099,758, Nov. 23. Compounding a cellulose derivative with an ester formed from an aromatic carboxylic acid and a form of a dihydric alcohol.

MOISTUREPROOF ARTICLES. Walter König (to Rudolph Koepp und Cie. Chemische Fabrik A.-G.). U. S. 2,099,812, Nov. 23. Moistureproofing shaped cellulose formate articles by coating them with a water-repellent varnish containing formic acid.

FILM SLIDE. Max Hagedorn (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,099,976, Nov. 23. A slide for photosensitized photographic material is made of a polyvinyl chloride in which the chlorine content is about 60–65%.

STEERING WHEEL. Hans Oehmen. U. S. 2,100,147, Nov. 23. A molded steering wheel rim is formed in sections around a metal core, each section being a fraction of a quadrant, molded from a synthetic resin in a shape such that the ends fit into each other on circumferences of different radii, the sections being screwed to the metal core.

PLASTIC PRODUCT. Jos. C. Patrick. U. S. 2,100,351, Nov. 30. Plastics of the olefin dichloride-polysulphide type are made by chlorinating cracking still unsaturates (boiling between 80 and 200°C.) and condensing with a polysulphide of an alkali metal.

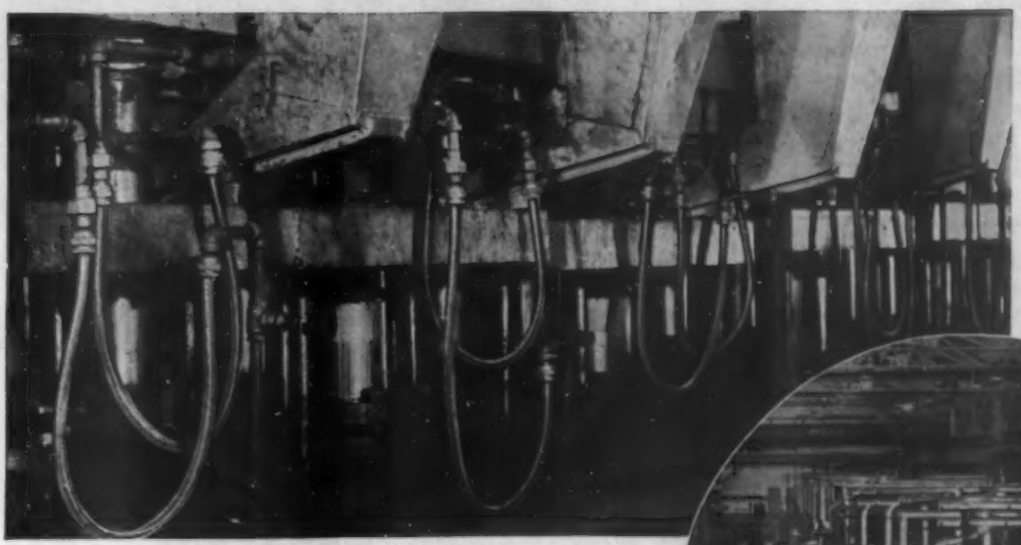
TRANSPARENT FOIL. M. M. Brubaker (to E. I. du Pont de Nemours and Co.). U. S. 2,100,377, Nov. 30. A moistureproof, heat-sealable transparent wrapping foil with regenerated cellulose base is coated with a wax in a polyether resin vehicle, the resin being derived from a polyhydric phenol and an organic polyhalide.

GOLF CLUB. Clarence W. Mansur (to General Electric Co.). U. S. 2,100,864, Nov. 30. A golf club head made of textile fabric highly compressed in a synthetic resin binder is molded directly onto the shaft of the club.

INTERPOLYMERIZATION. H. Fikentscher and J. Hengstenberg (to I. G. Farbenindustrie Aktiengesellschaft). U. S. 2,100,900, Nov. 30. Making useful products by interpolymerization of two substances in aqueous emulsion, the two having different polymerization speeds which are compensated by adding the faster component only as rapidly as the reaction uses it up.

GENERAL ELECTRIC'S MODERN MOLDING PLANT USES

Modern Flexible Connectors



LEFT—*American Seamless installed on G. E.'s special high speed molding presses.*

BELOW—*Battery of molding presses at G. E. —Pittsfield; all equipped with American Seamless.*

OVER 1,000 assemblies of American Seamless Flexible Bronze Tubing and couplings are at work in General Electric's plastics molding plant at Pittsfield, Mass.

The General Electric system of heating the molds calls for flexible tubing to convey water at 370° F. under 200 pounds pressure—and the pressure must be maintained with an even, smooth flow at all times. It is a tribute to our quality that General Electric chose American Seamless for this important duty. Regardless of whether hot water is the heating medium, or whether steam, or steam and cold water alternately must be conveyed to the molds or platens, American Seamless Flexible Metal Tubing has no rival—it is as leakproof as the *seamless tubes* from which it is made.

Available in several metals, principal of which is bronze, American Seamless is easy to install and simplifies quick changes from one mold to another.

Let us send you our 20-page catalog which describes, illustrates, shows typical installations and presents valuable engineering data on this modern, *leakproof* flexible metal tubing. Ask for Bulletin SS-3.

ANACONDA

The General Electric plastics molding plant at Pittsfield, Mass.

THE AMERICAN BRASS COMPANY

American Metal Hose Branch

General Offices: WATERBURY, CONNECTICUT

NEWS

THERE WILL BE A SYMPOSIUM ON PLASTICS AT the 1937 Regional Meeting of the A.S.T.M. to be held in Rochester, New York during the week of March 7th through March 11th. It is expected that all meetings of the Society will be held at the Seneca Hotel.

The general arrangements for the meetings will be in charge of a local committee of A.S.T.M. members headed by I. C. Matthews, Research Chemical Engineer, Research Laboratories, Eastman Kodak Co., with O. L. Angevine, Executive Secretary, Rochester Engineering Society, which holds membership in A.S.T.M., as secretary of the local group. All Rochester members of the Society will serve as members of the local committee and through the various subcommittees which will be appointed will handle specific details for the meetings.

The technical feature of the Regional Meeting will be a Symposium on Plastics to be sponsored by A.S.T.M. Committee D-20. The symposium committee is composed of the chairman of the Committee on Plastics, W. E. Emley, Chief, Division of Fibrous and Organic Materials, National Bureau of Standards, with personnel comprising the five chairmen of the D-20 subcommittees and a representative of the local Rochester committee.

H. M. Richardson, Plastics Dept., General Electric Co.; J. C. Pitzer, Chemist, The Formica Insulation Co.; L. M. Currie, National Carbon Co.; H. W. Paine, Chemical Director, E. I. du Pont de Nemours and Co., Inc., Plastics Dept.; G. M. Kline, Chief, Organic Plastics Section, National Bureau of Standards and Technical Editor of MODERN PLASTICS; Louis Shnidman, Laboratory Director, Rochester Gas and Electric Corp., completes the personnel.

The chairman of the Plastics Committee's subgroups are securing papers on the subjects within their respective scopes. The papers which are in course of development include the following:

A Revision of the Thermal Properties of Plastics and the Methods for Measuring Them—W. A. Zinzow, Bakelite Corp.

Flow Relations of Thermal Plastic Materials—C. H. Penning and L. W. Meyer, Tennessee Eastman Corp.

Permanence of Plastics—G. M. Kline, National Bureau of Standards.

The Properties of an Ideal Plastic—A. F. Randolph, E. I. du Pont de Nemours & Co., Inc.

Hardness as Applied in the Plastic Industry—J. C. Pitzer, Formica Insulation Co.

DEXTER NORTH, CHIEF OF THE CHEMICAL DIVISION of the U. S. Tariff Commission, has resigned to become associated with Arthur D. Little, Inc., research chemist and engineers of Cambridge, Mass., as their Washington technical representative.

In his new work Mr. North will continue to obtain and assemble technical, economic, and statistical information concerning the chemical and other process industries from the many active sources at Washington. Through his present association, however, similar investigations will be made directly for industrialists, as a part of the technical investigations made by the Little laboratories for their clients.

THE AMERICAN SECTION OF THE SOCIETY OF Chemical Industry has planned the following meeting schedule for 1938.

January 7. Joint meeting with American Chemical Society, Society of Chemical Industry in charge. Perkin Medal award to Frank J. Tone for work in the field of abrasives and refractories. Details of meeting will be published later.

February 11. Joint meeting with American Chemical Society, Society of Chemical Industry in charge. Speaker W. M. Phillips.

March 11. Joint meeting with American Chemical Society, American Chemical Society in charge.

April 8. Joint meeting with American Chemical Society, Society of Chemical Industry in charge. To be announced.

May 6. Joint meeting with American Chemical Society, American Chemical Society in charge.

THE SCHOOL OF FINE AND APPLIED ARTS AT Pratt Institute, Ryerson Street, Brooklyn, New York, is developing a Laboratory of Modern Materials as an important part of the education of students in the departments of Architecture and Industrial Design and it would be appreciated by the Institute and by this Publication, if manufacturers of these materials will send advertising matter and samples of their materials in their natural forms as a contribution to this work.

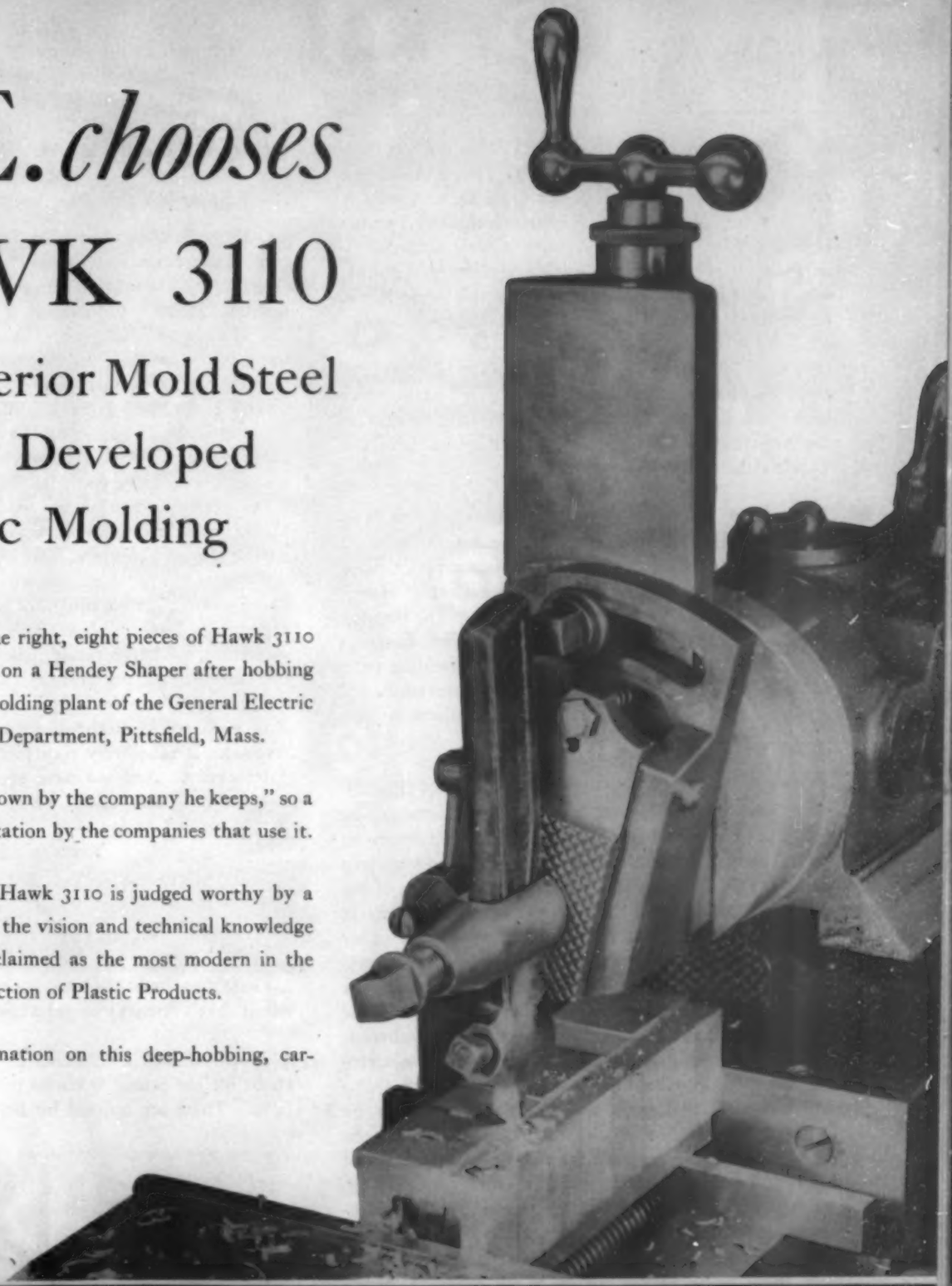
Materials may be sent to the Editor of MODERN PLASTICS or to J. Gordon Lippincott of Pratt Institute.

MUTED TONES, EXPRESSING THE HIGH FASHION interest in unusual pastels and subtle misty shades, are stressed in the collection of forty-eight woolen colors released recently in confidential advance swatch form by the Textile Color Card Association to its members. Margaret Hayden Rorke, managing director of the organization, cites these prestige colors as an important influence that is expected to register strongly in better merchandise for Southern resort and cruise wear.

RAYMOND LOEWY, NOTED INDUSTRIAL DESIGNER, has expanded the facilities and personnel of his New York and London studios. William Snaith, assistant in charge of store designs, sailed recently to join the London staff. He will take charge of a large modernization project contemplated by an important chain of British restaurants. The London office is also being retained by Allied Iron Founders, British Philco, General Electric, Radiation Ltd., Purma Camera and seven European automobile makers. Five new members have been added to the N. Y. office including Helen Cole former stylist at Macy's and Mr. Loewy has leased additional space for experimental developments and clay modeling.

G.E. *chooses* HAWK 3110

The Superior Mold Steel Specially Developed for Plastic Molding



In the picture at the right, eight pieces of Hawk 3110 are being machined on a Hendey Shaper after hobbing in the new plastic molding plant of the General Electric Company, Plastics Department, Pittsfield, Mass.

Just as "a man is known by the company he keeps," so a steel makes its reputation by the companies that use it.

We are proud that Hawk 3110 is judged worthy by a company which has the vision and technical knowledge to erect a plant acclaimed as the most modern in the world for the production of Plastic Products.

Write us for information on this deep-hobbing, carburizing alloy.

HAWKRIDGE BROTHERS COMPANY

303 Congress Street, Boston, Mass.

NEWS

A STOKES AUTOMATIC MOLDING PRESS INstalled in the plant of General Electric Co., is molding a urea coaster 3 inches in diameter (7.06 sq. in.) with a $^{5}/_{16}$ in. rim $^{1}/_{16}$ in. thick. The coaster weighs 11.7 grams and is molded automatically with a time cycle of 55 seconds. It is claimed that with a higher speed motor, which will be standard equipment on this press in the future, that the molding cycle can be shortened.

DR. H. A. BRUSON, RESEARCH CHEMIST OF THE Resinous Products and Chemical Company, has recently been elected 1938 Chairman of the Plastics Section of the American Chemical Society's Division of Paint and Varnish Chemistry.

THE 16TH EXPOSITION OF CHEMICAL INDUStries was held at Grand Central Palace during the week of December 6th. The plastics materials suppliers who exhibited at the Show were Bakelite Corp.; Haveg Corp.; Hercules Powder Co.; Neville Co.; The Resinox Corp.; Stokes & Smith Co. and Tennessee Eastman Corp. At Bakelite's booth an automatic molding press made by F. J. Stokes Machine Co. was in operation, and Hydraulic Press Mfg. Co. exhibited its injection press molding golf tees.

AN EVENING COURSE ENTITLED "CONTEMPOrary Interior Materials and Color" has been arranged by the School of Architecture at Columbia University to present in a well thought out and logical manner various aspects of this vital subject, which is so much part of our daily lives. Although intended primarily for architects and designers of interiors, it contains much of value for all who are associated with the use of color and materials. Methods and materials are dealt with in the light of similar practical considerations and aesthetics. These include the recent developments in metals, synthetics, plastics, compositions and the important new surrogates, as well as other industrial mediums, which are to be considered and capably handled by the designer.

Theodor Carl Muller, instructor in charge of the course, is engaged in active practice as an architect, and is also a designer of fabrics, rugs, metalware, packaging, glass furniture, interiors, shops, displays, mural paintings, etc. The course in Contemporary Interior Materials and Color will be offered again at Columbia University this coming Spring Session in the evenings, beginning early in February 1938.

CREDIT TO ALL PARTICIPANTS IN MODERN Plastics Competition is given so far as we have information available at the time of release. It turns out, however, that in the Competition just passed we didn't know that the cold molded handle on the Servet which won Third Award in the Household Group was the product of the American Insulator Corp., that the indicator and knobs on the Silvertone Radio which won Honorable Mention in the Decorative Group were molded by Erie Resistor Corp. Although these facts have been recently established, the information did not appear on the entry blanks.

The Editor, Modern Plastics:

On page 60 of the November issue of your journal you give illustrations and particulars of the German Sida camera. And you quite mistakenly state that it is the smallest camera in the world.

Will you permit us to point out to you that your statement is not true. The "Coronet" Midget has always been the smallest camera in the world. A "pull" of this camera is attached herewith, and under separate cover we have sent you a sample. As we sell a large quantity of these cameras in the States, we shall be glad if at the earliest opportunity you will publish a correction.

For your information we would say the "Coronet" Midget was first produced by us three years ago, and during the first eighteen months we produced them at the rate of 800 per day. We were actually selling twice this quantity, but we could not get sufficient of the very high grade lenses made to enable us to satisfy all our customers, with the result that we had to ration supplies down to 800 per day.

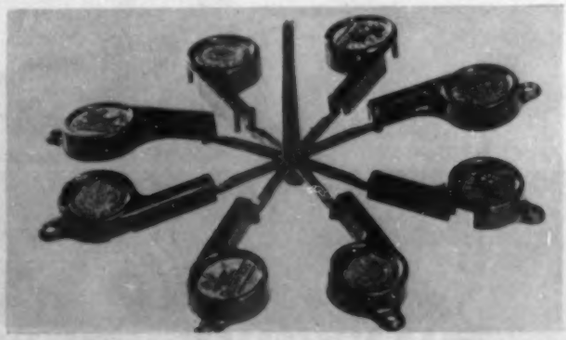
The camera is sold widely in New York at 2 dollars 50. You will find it in the shops of Meyrowitz on Fifth Avenue. It takes very tiny pictures which enlarge up quite easily. And we have seen really enormous enlargements in exhibitions which have been taken with the "Coronet" Midget.

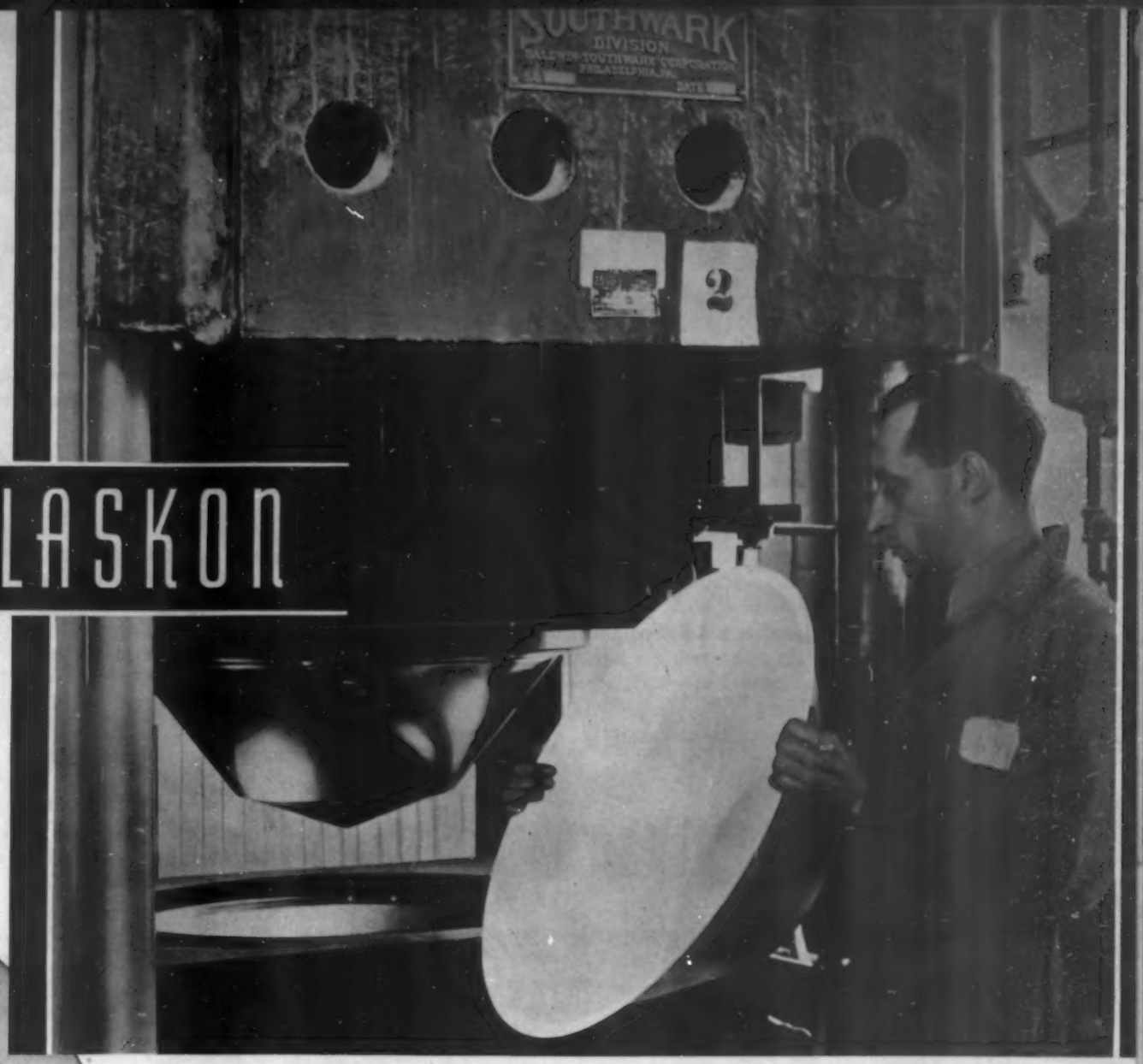
Yours faithfully,
(Signed) F. J. Pettifer
Coronet Camera Co.

310 Summer Lane
Birmingham 19
England

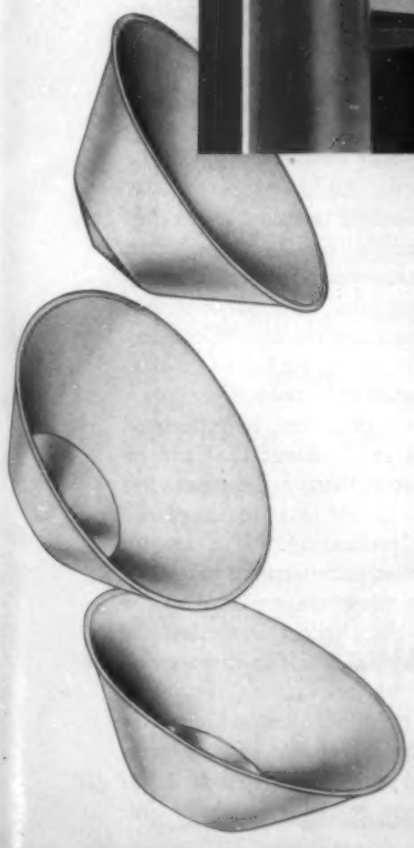
There's no doubt that you are right but you'll have to admit that's one way to get a camera.—*Editor*

WE SINCERELY REGRET OUR ERRONEOUS credit for the Scotty Whistles pictured in our December issue. These are molded by Bridgeport Molded Products, Inc., for Lewis & Scott Mfg. Co. They are injection molded of Tenite on a Reed-Prentice Corp. injection molding press.





PLASKON



Molded by General Electric
. . . Press by Baldwin-Southwark

This Plaskon reflector, the largest one-piece reflector molding so far produced by G.E., is a Southwark Press job . . . molded under 3,000,000 pounds pressure. It is 26½ inches in diameter, weighs 5 pounds, has good reflection and diffusion qualities, a mirror-like finish that is easily kept clean and toughness that makes breakage impossible under usual service conditions.

Use Southwark presses for exacting molding . . . for economical production molding . . . for lower maintenance costs. Use Southwark consultant service if you have a molding problem that is troublesome . . . if the results you are obtaining are not all that could be desired . . . if you need recommendations on methods or equipment.

BALDWIN-SOUTHWARK CORPORATION

Southwark Division, Philadelphia, Pa.

Pacific Coast Representative: **THE PELTON WATER WHEEL CO., San Francisco**

Consultants on Molding Equipment, Burroughs Engineering Company, Newark, N. J.

SOUTHWARK PRESSES

PUBLICATIONS

The Chemistry of Petroleum Derivatives—Vol. 2

by Carleton Ellis

Published by Reinhold Publishing Corp.
Price $20.00 **1464 pages**

To those familiar with the first volume of "The Chemistry of Petroleum Derivatives" this new volume will need no recommendation. As complete and massive as the first volume was—with its 1285 pages and some six thousand references—since its publication in 1934 the enormous amount of investigation in this field has compelled the writing of a supplementary edition at this time. The book includes a thorough treatment of pyrolysis, polymerization, hydration, halogenation, sulphonation and sulphation, nitration and oxidation of hydrocarbons. Profusely illustrated with more than 350 photographs, various topics treated deal with such diversified fields as detergents and wetting agents, paints, varnishes, lacquers and resins, solvents, motor fuels, lubricants, hydraulic brake fluids, textile penetrants, beverages, rubber, explosives, pharmaceuticals. J. M.

Polymerization

by R. E. Burke, H. E. Thompson, A. J. Weith, and I. Williams

Published by Reinhold Publishing Corp.
Price $7.50 **312 pages**

The subject of polymerization is developed in this book from the viewpoints of both academic research and industrial chemistry. The theoretical treatment of polymerization includes surveys of catalysis phenomena, reaction mechanisms, and the effect of molecular structure on the reaction rate, and a discussion of the liquid state as it is related to polymeric processes and products. The applied aspects are covered in chapters relating to polymerizations involved in the manufacture of synthetic resins, rubber and rubber-like plastics, and petroleum products. In lieu of attempting a complete coverage of the literature, the emphasis is placed upon providing an up-to-date and accurate impression of the field and trends within it. The excellent indexing of subjects, compounds, and authors, and the critical but ample bibliography on the various phases of polymerization make the book a handy reference work. However, the greatest value will be obtained from an early reading, because, to quote from the introduction, "polymerization researches have not even arrived at a resting place, much less a stopping place." G. M. K.

A 28-PAGE BOOKLET HAS RECENTLY BEEN issued by General Plastics Inc. describing Durez Molding Materials Products List. All the different types, strengths and colors of materials are listed by number, and physical properties as well as suggested applications are included. At the top of each page illustrations show the products which have been successfully molded of the various materials. Several pages are devoted to molding data and designing of parts.

CHICAGO METAL HOSE CORPORATION ANnounces two folders, one describing Rex-Tube and Rex-Weld Insulated Steam Hose; the other Metal Oil Hose.

POLYSTYRENE MOLDING MATERIAL IS INTERestingly described in a four-page illustrated folder issued by Bakelite Corporation who recently entered into production and distribution of this thermoplastic material.

PREHEATING

(*Continued from page 46*) even after four hours of preheating at 90°C. (194°F.) the flow is not seriously affected. However, after one hour at 110°C. the flow is affected appreciably. The curves in Fig. B account for choosing a range of temperatures for preheating between 82°C. (180°F.) and 105°C. (219°F.). It has also been determined in the laboratory that preheating below 82°C. (182°F.) does not improve the electrical properties appreciably. However, at temperatures as low as 66°C. (130°F.), closing time and curing cycles have been reduced.

Many molders today are preheating. There is but limited standard equipment available on the market, so they usually build their own. It is hoped that equipment manufacturers will become interested in the problem and furnish standard equipment to the plastics industry. In the meantime, the following may be of help to the molder who wishes to build his own equipment:

Most plants have available steam at gage pressures varying from 100 to 200 pounds. A box may be built to form an oven, using some of the common insulating boards and steel angle bars. Soft copper tubing can be bent to form coils in the oven. Additional angle bars can form shelves for trays or loading boards. Holes that can be opened and closed for adjustment should be left in the top and bottom of the oven to permit natural ventilation and adjustment of temperature. It is essential that an oven be ventilated to assure a uniform temperature. The oven of the future will, no doubt, use forced ventilation accomplished by means of an ordinary blower fan.

The design of the oven will, of course, be influenced according to the form and size of charge that can be handled. It is essential to so construct the oven that enough mold charges can be placed in it to afford the material sufficient time for preheating. If a molder places a new charge in the oven each time he takes one out for loading the mold, in the average plant, on the average job, provision for six charges automatically takes care of the time the material is left in the oven or "preheated."

Fig. 1 shows a special type of oven which uses aluminum cups for containing the charge of powder or preforms. The advantage of this type is that it is not necessary to open an oven door, resulting in loss of time

Don't Mold YOUR BUSINESS

To Fit Your Space

Most business housing . . . even most so-called "modern" housing . . . is, unfortunately, little more than a container for your business. Little more than so many feet of space in which to fit so many producing units.

***Ideal* business accommodations contribute actively to the smoothness and efficacy of every branch of your business activity . . . are a working arm of your profit-producing machinery . . . give you a tangible plus return on every rent dollar.**

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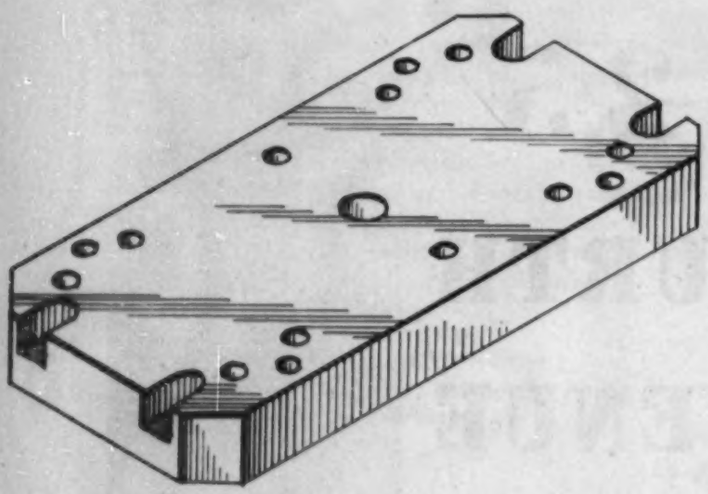
and drop of temperature in the oven to remove a charge. Fig. 2 shows another type of oven where separate drawers are used. Each drawer contains a mold charge.

It is essential that the preheating oven be located at the press to obtain efficiency. The advantages of properly controlled preheating of thermosetting materials are so many that it is safe to predict that in the near future preheating will be as widely used as tabletting is today.

MOLDS FOR PHENOL RESINOIDS

(*Continued from page 50*) tions, appears satisfactory, and is an instance where the exception proves the rule.



MOLDED BASE

FIG. IV.

Figure 4 shows the type of piece successfully produced by the flash filler plate type of mold.

Flash stripper plate molds

The flash stripper plate mold is, as the name implies, a type of mold fitted with a "plate," the function of which is to eject the molded pieces from the mold. A stripper plate mold may be flash, or positive, but is generally of the flash type. The advantage to be gained by the use of this type of mold lies in the rapid ejection of the molded pieces.

This mold, in its simplest form consists of parts of the usual flash design as enumerated for the flash overflow mold and in addition, a stripper plate. The force plate and stripper plate operate independent of each other.

During the loading operation, the stripper plate may be retracted in contact with the force plug, or it may be in position over the mold cavity, in which case the mold cavity is charged through the stripper plate, acting as a "filler plate." The force plug, in descending, initially traps the charge in the mold cavity and thereafter acts as a displacement plunger, forcing the excess material over the flash surface. Upon opening the mold, the plunger and stripper plate ascend as a unit, the molded part being carried out of the chase by the force plug. At the proper point, the motion of the stripper plate is arrested, and the continued motion of the force plug causes the stripper plate to remove the molded part from the force plug.

In some cases stripper plate molds are provided with knockout pins, to permit the clearing of any cavities where the automatic ejecting fails to function properly.

Flash stripper plate molds may be loaded either with preforms or with powdered material, depending upon the design of the piece.

This type of mold is suitable for commercial molding of simple pieces having thin bottom sections, in multi-cavity applications where the use of ejector pins might deform or puncture the bottom of the pieces.

For the molding of Navy designs of phenolic resinoid pieces, the flash stripper plate mold offers no advantages that cannot be obtained with other forms of molds. Moreover, as far as can be foreseen, designs will not usually be developed having such thin sections that ejection of pieces cannot be accomplished by the use of knockout pins.

There are a few so-called stripper plate, filler plate, flash molds in service which produce Navy bobbin-type switch handles. These molds have apparently produced satisfactory pieces in the past, but there has been no recent production from these molds under the present more rigid test requirements to form a proper basis for discussion as to their merits.—(*To be continued in February.*)

SAFETY GLASS

(*Continued from page 47*) for safety glass plastic and accounts almost wholly for the tremendous increase in the use of cellulose acetate plastic sheets, rods and tubes, from 2,482,111 pounds in 1933 to 13,036,497 pounds in 1936. Current production is even greater the first quarter of 1937, having been at an annual rate of over 15,000,000 pounds. Similar continuous processes are also in use for nitrocellulose plastic.

Meanwhile, an ingenious method of eliminating the difficulties bound up with nitrocellulose was found through the use of ferrous iron containing glass which sufficiently impedes the actinic rays so that undesirable deterioration of the nitrocellulose is avoided.[10]

A most interesting variation of the orthodox sandwich method for making safety glass is found in tempered glass.[11] For production of this material, plate glass of about $^1/_4$ in. thickness is heated almost to the softening point and cooled rapidly by air currents at a definite rate. The resulting product is in a highly strained condition, extremely hard and will stand very high deflecting stresses before bending far or breaking. Under sufficient impact and especially by impingement of small missiles the glass breaks into innumerable small pieces which have sharp edges, making the glass distinctly dangerous for automotive use. (*Please turn to next page*)

BOXES OR ? ? ? ?
THE STORY'S THE SAME

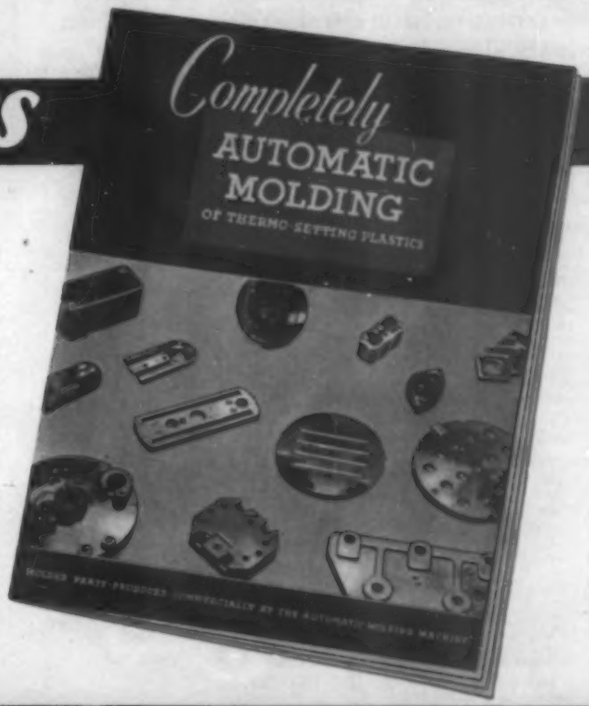
Whatever the molded plastic product, if it's made by Auburn Button Works, you can be sure of the utmost in satisfaction. In the case of the box shown, a graceful sales compelling design and a finish of lustrous beauty was desired. The buyer got it! In the case of mechanical or electrical parts with close tolerances, or whatever the job, the story is the same . . . you get what you order . . . plus the economy and the extra measure of skill that comes from Auburn's 60 years of pioneering experience in the molding of plastic products.

Molded Plastics Division of

AUBURN BUTTON WORKS, INC.

AUBURN, N. Y. **Established 1876**

It's NEW and it's News



The Stokes' completely Automatic Molding Machine was a sensation at the recent Chemical Show... spectators surrounded it four and five deep to watch it perform.

If you failed to see it send for complete information on the molding machine that makes short runs profitable . . . that uses inexpensive single-cavity positive type molds... that is completely automatic, requires no operating attention... that makes dozens of molded parts per kilowatt of power consumed... the machine that cuts costs materially on a wide range of simple parts. Ask for new folder No. 709 and souvenir rule molded at the show.

F. J. STOKES MACHINE COMPANY
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F.J.Stokes MOLDING EQUIPMENT

FJS Est. 1895

Satisfactory as cellulose acetate has been, there are still numerous points in which it could be improved. It has been somewhat difficult to get a well balanced plastic; that is, a plastic which would furnish safety glass of about the same breaking strength at 0 deg. F. and 120 deg. F. when tested under a falling ball. The laminated glass industry uses either a 2-pound or a 1/2-pound ball drop test to gage the quality of its safety glass; and its alertness in being on the lookout for plastics which would improve this break test was largely responsible for the introduction of the synthetic resin derived from unsaturated polymers as an interlayer.

Almost every synthetic resin has been proposed at some time or other for safety glass plastic. Most of them, however, suffered from the general defects of sharp melting point or lack of toughness. One of the first commercial efforts to introduce synthetic resin resulted from work on acrylate resin which (applied as a film rather than a sheet) permitted unusual ease in cutting the finished autoclaved glass sandwich to shape.[7] The most significant effort to date, however, appears to be based on the vinyl acetal resins which are basically described in the Morrison patents 2,036,092, Reissue 20,430 of Shawinigan Chemicals Limited. Plastics made from these resins have an almost rubber-like stress strain curve.[8,9] Not only do the vinyl acetal plastics give good break tests, but they are also sufficiently waterproof to eliminate the necessity of undercutting and edge sealing; and they are sufficiently adhesive to make the use of special cements superfluous. The greatest commercial activity in this field has been concerned with the butyraldehyde derivative, but it also appears that acetals from all the lower aldehydes show promise. It is risky to prognosticate safety glass trend, in view of the rapid changes of the last few years from nothing to nitrocellulose and then from nitrocellulose to cellulose acetate; but, it appears that the next change which takes place may very likely be toward the vinyl acetal resins or some other polymer of unsaturated organic compounds.

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F. A. Parkhurst—No. 1,844,972.
E. R. Derby—No. 1,845,949.
G. J. Esselen, Jr.—No. 1,851,944.
G. J. Esselen—Reissue No. 19,986.
F. A. Parkhurst—No. 1,861,917.
R. G. O'Kane & E. R. Derby—No. 1,979,762.
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Emile Geisel—U. S. 2,007,645.
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[10] J. H. Sherts—U. S. 1,604,761.

[11] Vogt, Kunststoffe 22, 202-4, 1902; Röhm, Sprechsaal 66, 43-5 (1933); Wilson, J. Soc. Glass Technology 17, 296-304 (1933).

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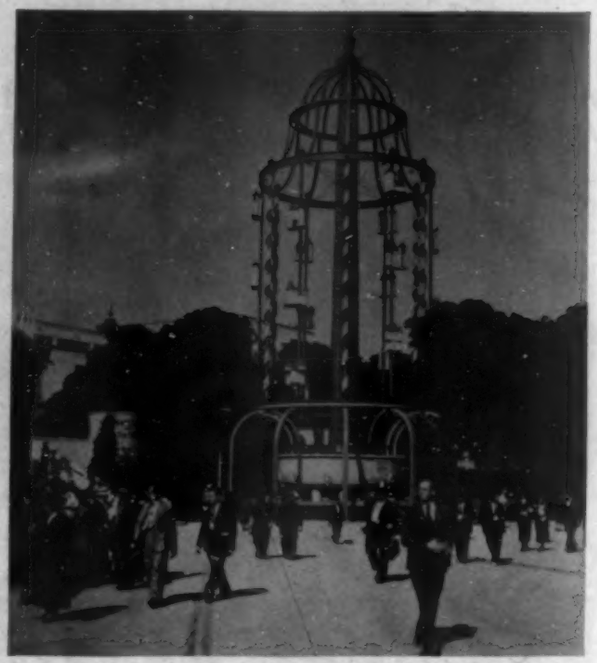
PARIS EXPOSITION

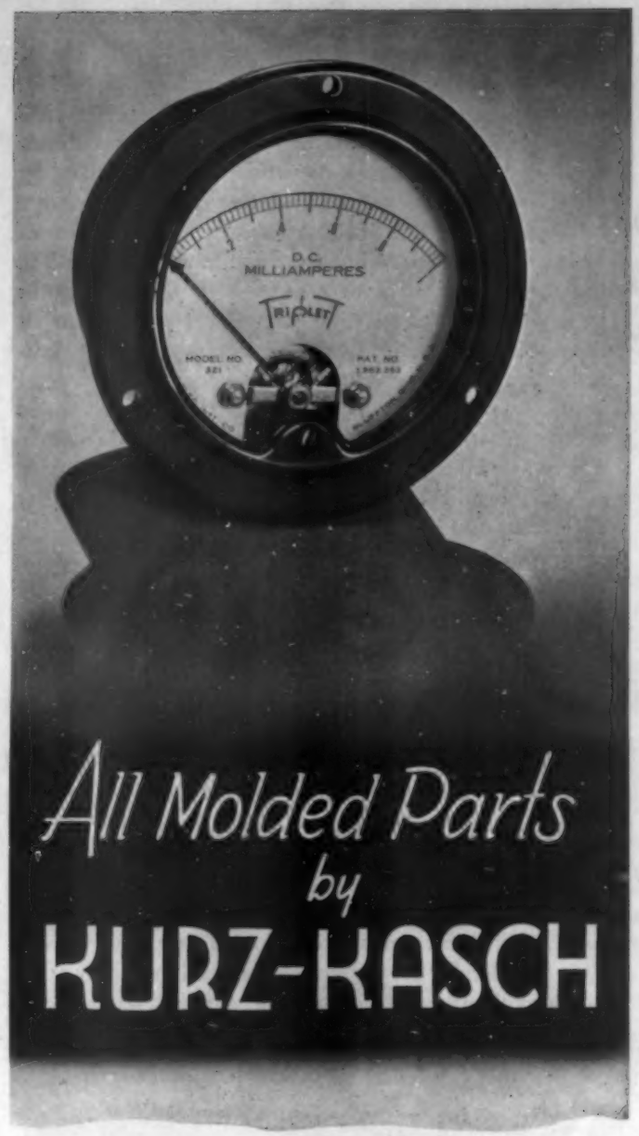
(*Continued from page 35*) door lighting which is one of the principal night attractions of the Exposition. Festivals of Light and Sound on the Seine were planned by Beaudouin and Lods and are a remarkable achievement in the use of such diverse elements as electricity, water, sound and smoke. Luminous fountains were installed which, during the day, would present no obstacle to river navigation and which, at night, could be put in place quickly. This was accomplished by the use of submersible luminous fountains, which during the day,



Wine Tower constructed of transparent corrugated Rhodoid over which wine flowed

lie at the bottom of the Seine and are brought to the surface in the evening. Projectors were used in five principal colors, equipped with submersible lamps with plastic screens. Illumination of the Eiffel Tower was obtained by the use of neon lights on the lower arch, and the entire tower is lighted by projections covered with colored cellulose screens. All the *French Colonial Pavilions* are installed on the Ile Au Cignes, and a good part of the night lighting is effected by lanterns, totems, Chinese lights, and luminous balls of cellulose.

In the field of publicity there are some new applications such as male and female mannequins with hair of laminated silver perliane; yellow or rose florescent transparent reeds; plastic and neon combinations, such as were shown in the *Hall of Foods*, in a cocoanut tree with large green leaves lighted in the center with neon tubes; large presentation cups in transparent plastics at the *Hall of Asbestos;* and cylinders and display windows in transparent materials for the presentation of machines and other products at the *Roumanian and American Pavilions;* stands and display windows at the Pavilions ex-



This instrument by Triplet is another example of the ability of Kurz-Kasch to supply molded parts of every conceivable variety.

Kurz-Kasch has the facilities to produce difficult pieces as well as parts required in great quantities such as radio knobs, selector buttons, utensil handles, and similar items. Many standard molds available without charge . . . your choice of any of the preferred materials.

Join the manufacturers who can say . . . "Molded parts by Kurz-Kasch."

KURZ-KASCH, Inc.
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Branch Sales Offices: New York, Chicago, Cleveland, Detroit, St. Louis, Los Angeles, Dallas, Milwaukee

KURZ-KASCH Inc.

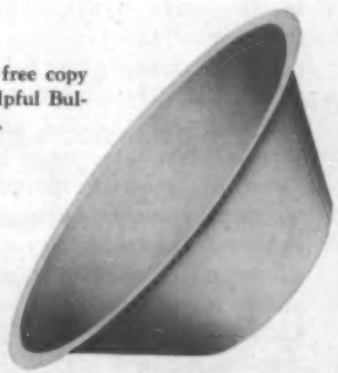
General Electric Knows How to cut Mold Costs

Expensive labor in making the molds is safeguarded by choice of the right mold steel, in the New Textolite Molding Plant of the G. E. Plastics Department.

This G. E. craftsman in the Pittsfield plant is grinding the holes in a mold cavity for the fitting of pins. The mold on which he is working is made of Carpenter No. 158.

Write for Bulletin describing the properties of this and other Carpenter Mold Steels. It shows how to select and heat treat mold steels for best results — how to get easier hobbing and cavities that take a mirror finish — how to make molds that will not distort or upset in service.

Get your free copy of this helpful Bulletin now.



This largest of all plastics was molded by G. E. with Carpenter Mold Steel.

THE CARPENTER STEEL CO.
12 W. BERN STREET . READING, PENNSYLVANIA

Makers of Fine Tool Steels Since 1889

Green transparent Rhodoid chair from the Decorative Artists' Pavilion

hibiting feminine attire, metal frames with panes of transparent acetate material to display books, cosmetics and jewelry.

Besides the uses mentioned, there were architects' models; carpets and ornamental curtains in flexible reeds or in tubes; dolls, knitting needles, carved transparent and opaque chess sets, eye glasses, opera glasses, umbrellas with plastic handles, and Albene fabric, a flat threaded rayon material with cellulose acetate base made by the Society Rhodiaceta; combs, brush handles, fountain pens, labels, and book bindings; geographical maps in transparent plastic to permit by juxtaposition of several maps, easier teaching of physical, administrative, political, ethinographic, industrial, and economic geography; and transparent skeletons for teaching anatomy.

At the *Safety Pavilion*, plastics played an important part in the manufacture of bodies and oculars for head pieces of gas masks, transparent globes, portholes for warships, barracks, fortifications, and transparent protections for certain factory operations. There were also shown in this pavilion, panels made florescent or phosphorescent by paints and varnishes made with plastic bases. This type of decoration together with supports of cellulose acetate is used in France in aviation, war, and merchant marine, for lighting of passive defense shelters, cinemas, theaters and public places. Thus are made labels, sign indicators, order tables, the faces of maritime indicators which must remain luminous at night in case of short circuit, or which may be easily concealed from discovery from the air at night.

LAMINATED WOVEN VENEERS

(*Continued from page 39*) toward flat surfaces instead of sunken panels. For such purposes as huge hospital doors, which are necessarily made flat for sanitary reasons, decorative strips or panels may be specified by the architect to relieve the plainness of unusually large surfaces. Architects have resorted to this feature of design using ordinary veneers which must be treated in the regular manner with a varnish finish, usually not in any sense wear-resisting unless accomplished in an expensive manner; in fact, it requires about six operations to finish an ordinary wood panel in a hospital door. By using this new material, the doors are supplied with a plastic surface, which can be applied to plain veneer as well as the marquetry style panel, and arrive at the job in a finished state with no operation other than hanging to be performed.

"Owing to the fact that practically any design can be produced readily, this woven veneer will undoubtedly find a place for itself in the novelty field as a surface for such articles as handbags, or it may be used as inlays in jewelry boxes or packages for toilet requisites. Panels on rouge boxes or powder compacts and on other small articles in which present-day design leans toward modern treatment, can be simply and effectively accomplished.

"But," Mr. Kiesecker warns, "marquetry is a refined accent for whatever application is being made with it, and it cannot be used by the mile. On the contrary, it must be chosen with discretion and with an underlying knowledge of how to take advantage of its characteristics. If used too lavishly, it becomes cheapened. Every type of material has a distinct application and must fit into certain niches if it is to accomplish its creator's

Herman Bag Co. is responsible for this smart light weight bag with woven veneer sides

SHRINKAGE

ANNOUNCING

No. 1962 NON SHRINK BY MAKALOT

Problems of Shrinkage Cured by MAKALOT

To meet the ever increasing demand of *undercut dies, close design tolerance and ejection problems* MAKALOT offers its new No. 1962, in black, brown and colors, as THE non-shrink compound. Not a rehash or alteration of some existing formula but the result of scientific investigation involving *new developments in resin and compounding.*

The slow-cure soft pieces and poor finish generally obtained with many low shrinkage materials is therefore never encountered as the cure and finish on MAKALOT No. 1962 are *comparable with those of the best phenolic molding materials available.* It can be supplied in any color.

The proverbial "one thousand and one" best bespeaks the modern application of the scientifically designed MAKALOT materials and "A thousand to one" are the odds in favor of a MAKALOT solution to your problem.

MAKALOT CORPORATION

262 Washington Street

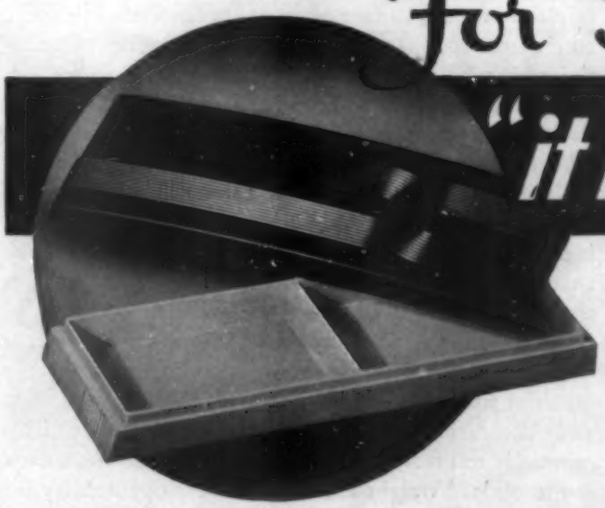
Boston **Mass.**

Factory, Waltham, Mass.

Phenolic Compounds, Resins, Laquers and Alkyds

For Sales appeal

"it Must be Right"



It is good merchandising to combine products into one complete set in order to increase the unit of sale. An excellent example of such far sighted merchandising is pictured.

This lustrous plastic molded card box with black Bakelite cover and Ivory Urea Box has an unmistakable look of quality that wins at first sight. Its attractive design and color and practical durability, insures long use by the purchaser.

When considering the use of plastics to merchandise your product, call The Waterbury Button Company; their designing and engineering departments will be an asset to you . . . FOR SALES APPEAL . . . ***"it Must be Right"***

MOLDED PLASTICS DIVISION

THE WATERBURY BUTTON COMPANY

39 RIVER STREET EST. 1812 **WATERBURY, CONN.**

NEW YORK CITY BOSTON PHILADELPHIA ROCHESTER DETROIT CHICAGO TORONTO

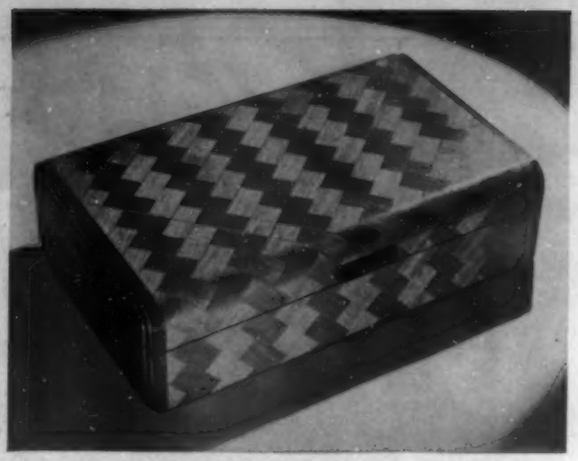
ANOTHER OUTSTANDING ATTLEBORO CABINET

This beautiful cabinet recently molded for the Dentists' Supply Company of New York is another successful job by Associated Attleboro Manufacturers . . . light, durable, easy to clean, opening and closing with ease in any temperature, constructed so that any number of drawers may be added, it has made an invaluable piece for the dentist's office.

For you, too, Associated Attleboro can mold a housing of surpassing beauty, accuracy, durability, strict economy. Year in and year out, we have shown consistent ability to improve on methods of fabrication; to eliminate molding difficulties before they arise; to produce work that is superior in all respects at lower molding costs.

If you have a molding job on hand, whether housing, premium, product part or package, see Attleboro first. Our consultants will be glad to call and discuss your problem.

ASSOCIATED ATTLEBORO MANUFACTURERS, INC. ATTLEBORO, MASS.



Silver chest illustrating the use of woven veneer in packaging is made by Wilder Mfg. Co.

intention. This is true of the commercial development of any kind of material and woven veneer is no exception to this formula."

Mr. Kiesecker is now working on a ship design in which he hopes to make use of this new material. He intends to include a modern room with panels of this product under the windows and on the doors to test its application as a surface treatment, comparatively inexpensively obtained and with long wearing qualities as well. He believes that the material in a parquet weave could be used to advantage as a border around the edge of a carpet at a much lower cost than actual parquet and experiments are being conducted to bear out this theory.

The laminated woven sheets are strong enough to be employed for the surface of canoes or lifeboats. Indeed, an eighteen foot canoe, surfaced entirely with the material was produced last summer for test purposes. A heavy plastic surface was used and the material adapted itself easily to the shape of the canoe. A Maine guide, who ran the canoe through its paces, reports that it glides smoothly through the water and slides off rocks instead of sticking to them the way a canvas canoe is inclined to do. The canoe is a great deal lighter in weight than one made of almost any other material and although the first cost might be more, less needs to be expended in upkeep, for it doesn't require painting each year.

Aviation and automotive engineers are studying the material with considerable interest for both construction and decoration. Its light weight and flexibility especially recommend it for air craft interiors where each ounce of dead weight eliminated means opportunity for greater paying loads. It has long been felt that automobile interiors with dust-collecting fabric panels and ceiling will be eventually replaced with a smooth, easily cleaned interior when a suitable material of reasonable cost is provided to bring this about.

This is the first combination of its kind of plastics and veneer. It has been said by many designers and architects that no substitute is as lovely as wood itself and this process retains every bit of the detail in the grain of wood and gives it a protective plastic covering which is easily cleaned and permanently finished.

Jos. Stokes Rubber Co.

Reg. U. S. Pat. Off.

322 WEBSTER ST., TRENTON, N. J.
CANADIAN PLANT, WELLAND, ONT.

MOLDERS SINCE 1897

Call it what you will—a certain knack or a better insight into customers' problems. The fact remains that we are attracting many manufacturers of national reputation because of our ability to gear our production facilities to their needs and to introduce new economies into plastic molding.

Try us with blueprints—intricate or simple, large or small.

PREHEATING OVENS

11" x 11" x 9" high inside.

1. Greatly increase press production
2. Improve product, finish and color
3. Speed up press closing and curing time
4. Improve electrical properties
5. Reduce rejects to a minimum
6. Reduce tendency to break inserts and core pins
7. Reduce production costs

DESPATCH Preheating Ovens provide uniform heating of plastic powders and preforms under constant automatic temperature control. DESPATCH Preheating Ovens are available in all sizes and arranged with electric or gas heating systems. Of compact design, DESPATCH Preheating Ovens are ideal for table or floor mounting, near or between presses. Prices range from $100.00 upward.

24" x 24" x 36" high, inside. Note removable shelves for trays.

DESPATCH OVENS

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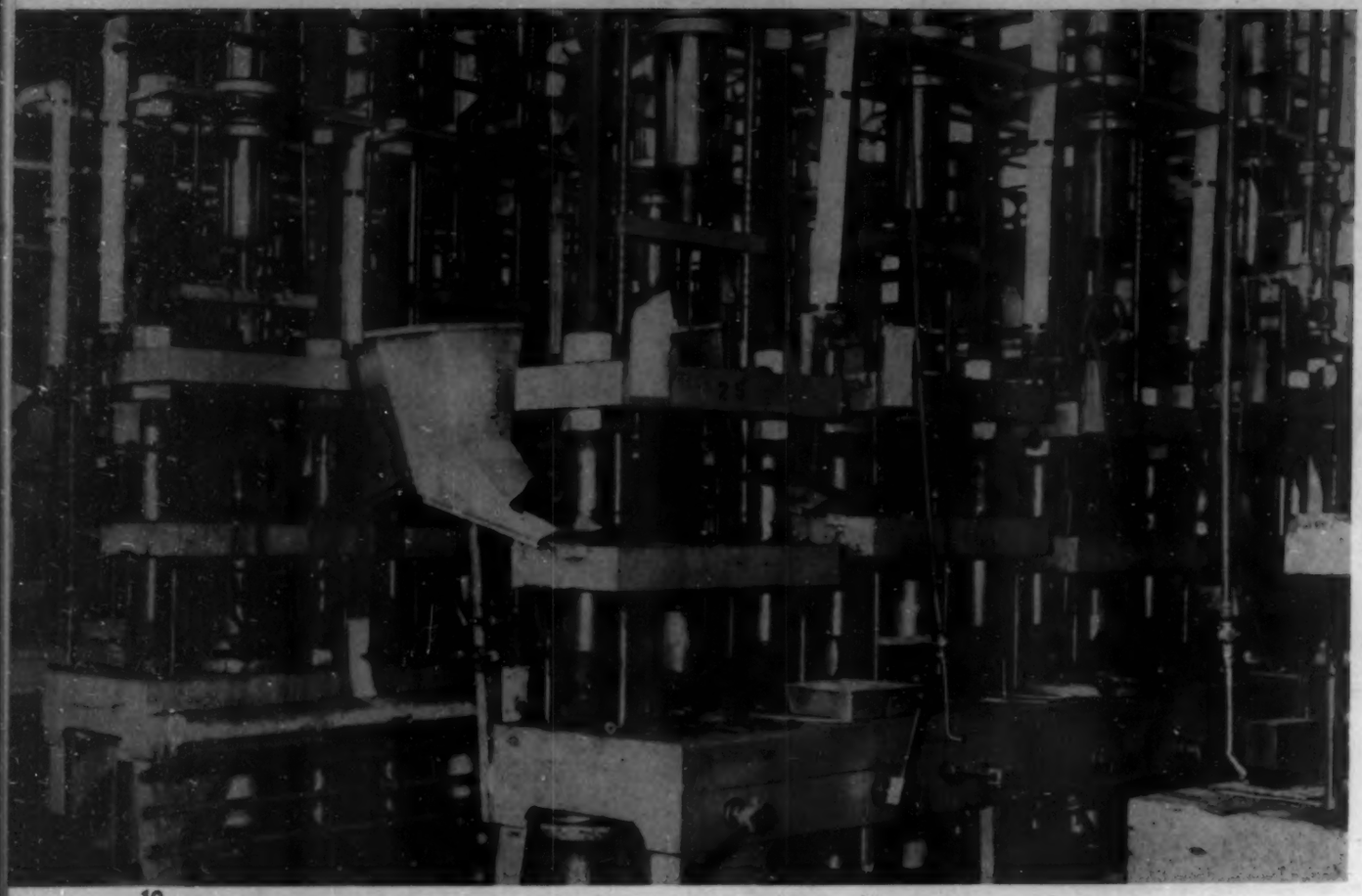

19

Fig. 19. Battery of high speed presses showing convenient location of controls and air cylinders for operating knock-out bars. There are 94 of these presses, designed and built by G. E.

ONE PLASTICS AVENUE

(*Continued from page 33*) plastics. One is to develop new materials which will expand the market for plastic products, and I mean by that, new things we haven't heard about before rather than simply replacing applications already existing, and to go beyond this, opening up new fields.

"The other phase is to expand our sources of raw materials because, of course, we all realize that natural phenol is a by-product and there is only so much of it in relationship to the amount of coal distilled each year. The plastics industry is growing faster than coal distillation which is bound to produce a serious shortage of phenol. Therefore, through research we have to find other raw materials which will allow these phenols to go further or to find something to take their place. Synthetic phenol is made of benzol of which there is plenty but that doesn't help the cost. Synthetic phenol is actually more expensive than natural phenol but there is a hope that some enterprising person will find a more economical source of supply or a more economical way of making it so that it will be practical to use.

"Naturally, we look to some of these substances that may be used to extend phenolic resins to make them go further. There is some promise in that direction but we have found that a lot of development work must be done before we get exactly what we want.

"There is a third consideration and that is to improve the properties of the materials that are available by refining our processes and by the same means reducing our costs. These are the general objectives we have set up and although we have had a considerable measure of success so far, we expect to obtain even greater benefits in our new plant during the coming year."

Tool room

From here we will go into the machine shop or tool room where all G. E. plastic tools, dies and molds are made and where many of the special presses used in the molding plant are designed and turned out. This is a huge room with skylights in the high ceiling and one wall entirely of glass, which makes it a light and pleasant place in which to work. Upon entering, we face three aisles flanked by the most modern tool room equipment we have ever seen. At the right is a bench running the full length of the room directly in front of the windows, where finishing and assembling operations are completed under ideal lighting conditions. Back of this is a battery of duplicators where identical

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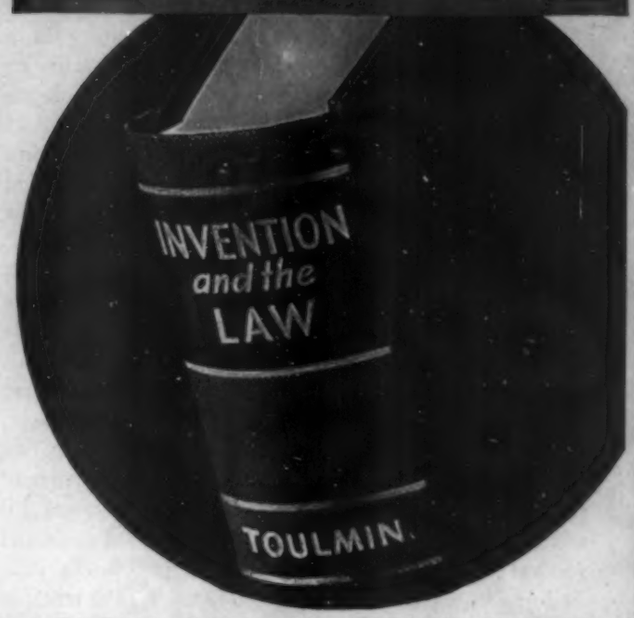

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*Reg. U. S. Patent Office

cavities or molds are made from master designs. At the left, the engraving and grinding operations are performed by mechanics of long experience and great skill.

As we walk down through the room we pass shapers, planers and grinders of all sizes, including a planer that takes a 1/8-inch chip off a 6-foot bar of steel at each operation. One machine we found fascinating is a multiple drill used for channeling molds, in which five or six channels were being bored at one time up to a depth of 24 inches in a solid block of steel. (Fig. 13.)

At the far end of the room is the steel storage section where every known type and size of mold steel is carried in stock for immediate use. Soft steels are cut with a torch while tool steels are sawed with mechanical saws. Magnetic chucks are used on practically all of the grinding and milling operations. Beyond the tool room is the hobbing room with a 1000-ton hobbing press capable of forcing master dies into blocks of solid cold steel.

Speaking of the efficiency of operating under the new set-up, the engineer in charge of this department said, "In our new tool room as it is now in operation, we have attempted to accomplish the reduction of costs of molds. We have put in considerable new equipment, all with the idea in mind of decreasing the cost of tools and we have changed our system a little to achieve this. In doing so, we have attempted to specialize the work as far as possible. The men employed are all first-class craftsmen but where they specialize on particular operations, it increases their efficiency and steps up the production of dies.

"Making molds is not like an assembly job because the flow of work is not uniform. When an order comes to our tool department, it first goes on our drafting board and a complete design is drawn up. Then the planning department plans the job for the shop, orders the material, and turns the job over to the foreman who gives it to various men for the necessary operations such as cutting the steel, shaping and grinding, then back to the lathes or duplicators, polishing, hardening, and thence to the assembly section where it is put together into a mold. We find that by having men specialize on these operations we have been able to reduce our cost and improve the quality. We depend upon skilled labor rather than automatic machinery and, therefore, find that the more skilled the man is in any particular operation, the better work he turns out.

"Even on the so-called automatic machines, an operator with a background of experience who constantly uses that machine, develops a touch or technique which

Fig. 20. Various inserts when required are usually placed in the mold by hand before the compound is added. Fig. 21. Close-up of one of the high-speed presses showing preforms being heated against the hot mold. Fig. 22. Knife handles being ejected from an injection press

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23

Fig. 23. The pilling, or preform room where compounds are pressed into "briquets" for efficient molding. Rotary presses are on one side, single-punch presses on the other

enables him to get more and better work out of it than an operator who might use the machine occasionally."

It is interesting to note that the average length of service of men employed in the G. E. plastics tool room is fourteen years. As a matter of fact, the management contends that a man fifty years old, because of his experience, background and skill, is obviously more valuable than some younger man.

"The cost of tools," says this official, "has always been something that the customer shies away from. He doesn't like to spend that much money because it seems like taking money out of his pocket and planking it down before he even sees anything for it. Therefore, if the cost of molds can be brought down to a point where the item doesn't look so large to him, there is going to be an increased use of plastics. This is not so much a matter of difficulty with large applications because there, I think, the trade realizes such things are going to cost money to produce, but with small articles where you can hold a dozen in your hand, it is pretty hard to tell a man he must make a substantial investment in a tool before production begins.

"We are always being told that the tool cost is still the biggest item and the hardest thing to sell to the customer, but since we yet have been unable to find anything to replace steel for molds, our only hope of cutting costs further is to specialize to the point where they can be produced with utmost efficiency and economy."

The new tool room gives an increased capacity over the previous one of about 100 percent, and about 20 percent additional equipment has been provided. The greater floor space gives opportunity for more efficient handling of the material and the equipment is arranged as nearly as possible for continuous production. With steel storage at one end of the room, the work flows from there in almost a direct line to the different machines which are segregated, and each section is under the supervision of a man specially trained in that type of work. Since one supervisor has not more than thirty men under his jurisdiction, he is in a better position to devote his time to the speedy handling of each operation.

There are 132 employees on the payroll in the tool room at the present time including apprentices. Recognizing that the tool room is the bottle neck of the industry and that trained mechanics are hard to get, G. E. has established an apprentice system, manned mostly by local young men although a few of them are from other states. Some 30 of them are now starting through and as they graduate, they will be replaced, for it is planned to keep about that number in apprenticeship all the time. These young men to be eligible must be at least high school graduates and mechanically apt.

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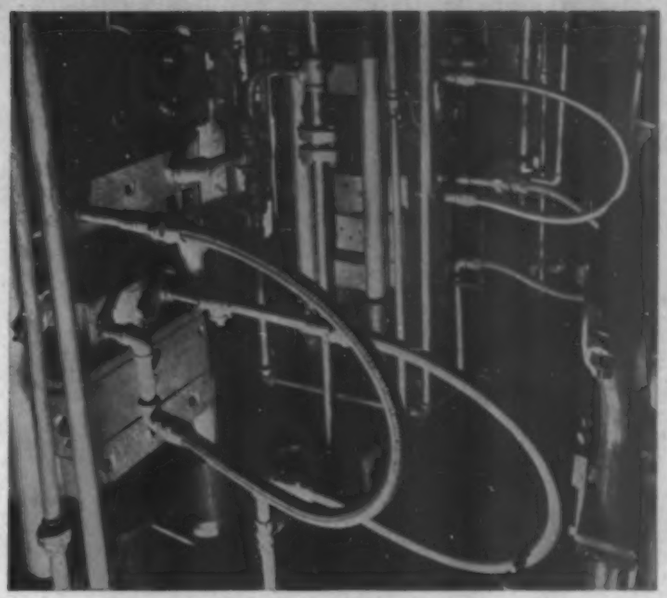

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These boys are not only being trained for tool makers but are also getting experience which will later equip them to become foremen, engineers, tool designers, salesmen, sales engineers, etc., if they have the ability and the persistence to carry on. They all work under one foreman who is experienced both as a craftsman and in working with youth. He has supervision only of their work, devoting his entire time to their training.

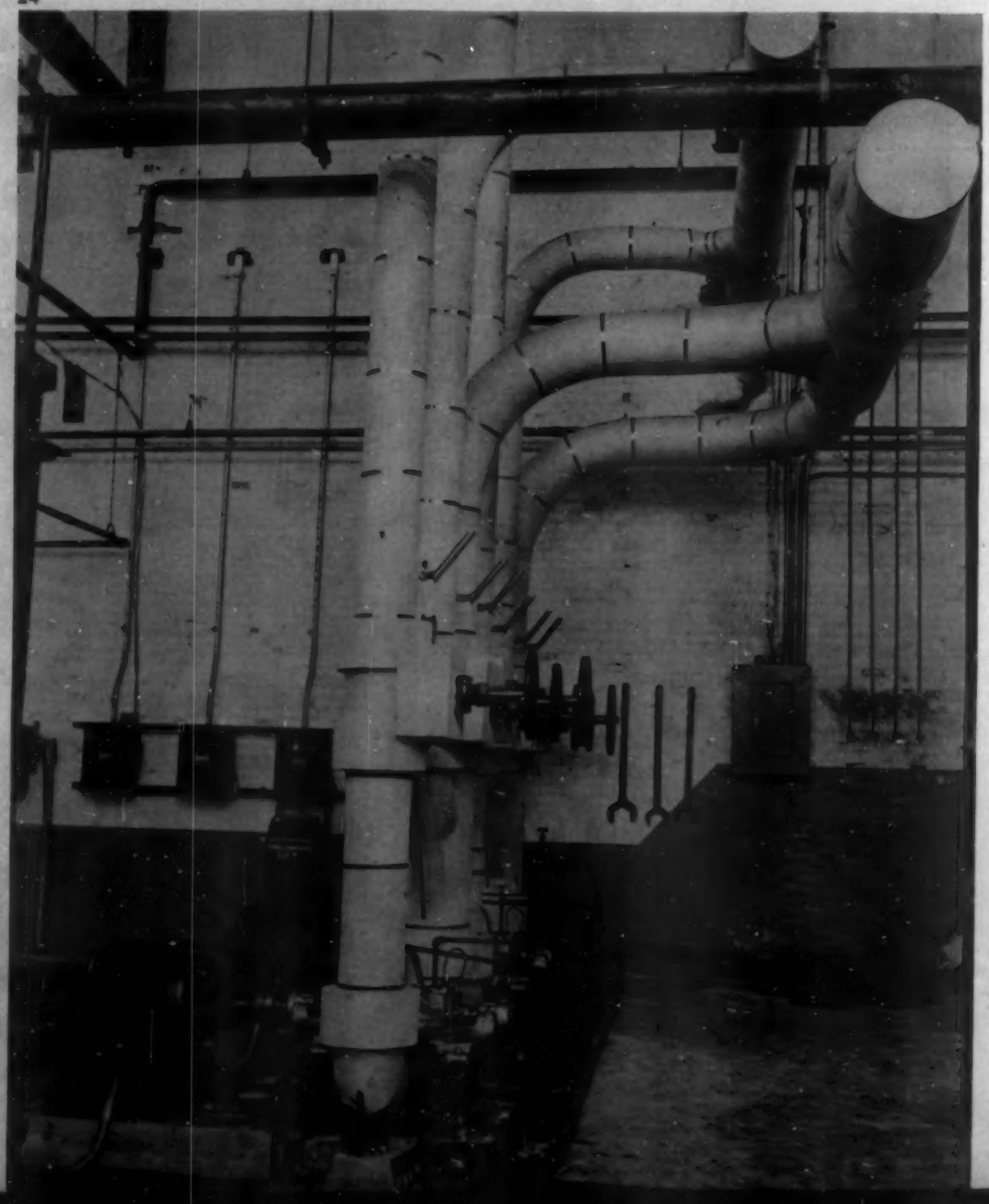
All the present tool designers at G. E. and more than 70 percent of its engineering force worked in the shop first. It is felt that the heart of the entire plastics industry is the tool room, because if you can't build good tools, you can't get a correct molded part, and G. E. Management believes that men, whether engineers or foremen, must have experience in the work in general as well as in the specific operations they are expected to perform, so it trains them along such lines.

The men in the tool room work eight hours a day, five days a week and generally extra shifts are avoided. This is because it is difficult for a new worker to pick up a job on which another man has been working all day. It means at least an hour or an hour and a half of lost time for him to check the whole thing over to see what has gone before, and there is increased chance of error besides the lost time. When night shifts are required, the work is split into two parts so that one man doesn't attempt to continue on another man's work.

Approximately 500 new molds are made each year in this tool room and they run anywhere from 60 pounds to 5 tons in weight. The average mold will probably weigh about 250 or 300 pounds. The tool room represents an important part of the total investment in the new plant and a number of additional machines are on order at the present time.

Steel, according to our guide, is of tremendous importance in the making of molds and a metallurgist is employed whose entire time is devoted to the study and examination of new steels which are being worked out in cooperation with steel manufacturers to provide increased machinability. Besides investigating different types of

Fig. 24. Control station of the Ross Supertherm System showing pumps that distribute superheated water to the presses, together with mixing valves, gages, etc., which control the temperature



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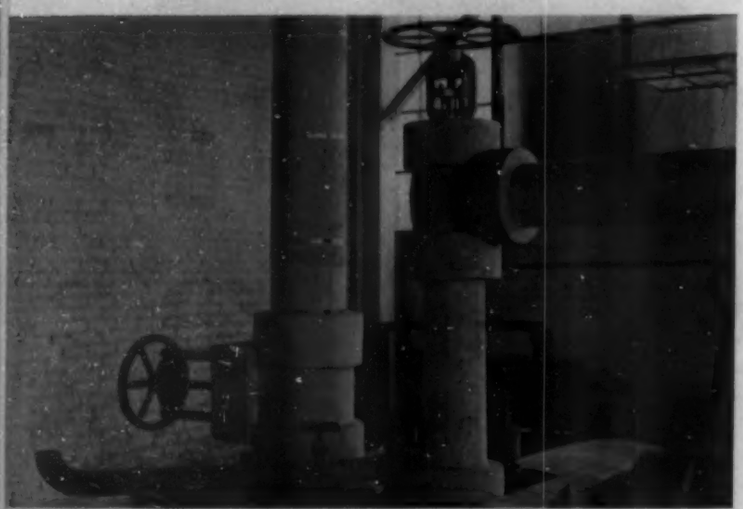
steel, all sorts of tests are made in cutting and grinding with the result that a new type of cut die steel has been developed. Grain in steel, we are told, is of extreme importance and must be well controlled in the hardening process. If subjected to too much heat, a coarse steel structure will result which will break under the pressures required, and maintenance costs will increase.

"We have worked out a new method for hardening steel," continued our guide. "Under old methods the pieces had to be packed in boxes together with carborizing agents in the form of charcoal or other appropriate materials. Our up-to-date method of hardening consists of a furnace in which we do our own carborizing. When ready, the pieces go directly into the furnace and a cover is automatically sealed entirely obviating the necessity for packing. Under this method, possibly four or five hours are required to do the job as against sixteen hours required by the former method."

Asked what he thought might represent the next great improvement in the making of molds our informant said, "I feel that the most important thing to look forward to is the development of materials rather than actual molding technique. With present molding compound, heat brings it to a stage more like a gooey mass, and tremendous pressure is required to make it flow into the crevices and corners of the mold. Heat alone is not enough to make the material flow adequately to properly fill the mold. If materials can be developed so that less pressure is required, it will mean lowered tool costs because the same types of steel wouldn't have to be used."

From these pipes atop the boiler, either hot water or steam is made available for the plant. Below are the expansion loops in the Supertherm feed lines



Molding room

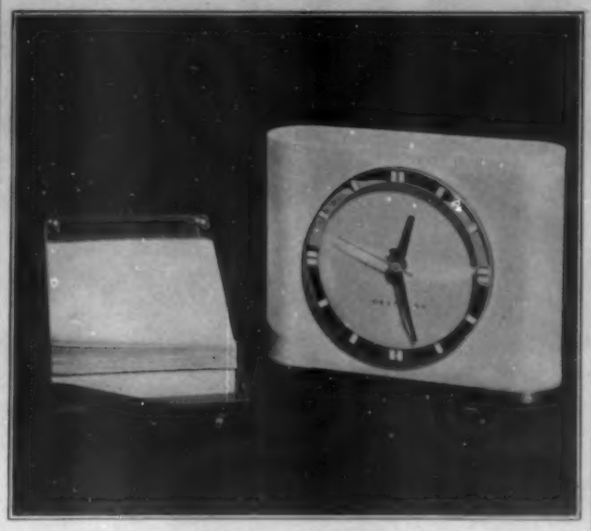
The molding room, which is 250 feet long and 100 feet wide, adjoins the tool room and is laid out with three banks of presses divided by two aisles running the full length of the room. Here again, everything is designed for streamline production with overhead cranes for handling heavy molds and broad aisles through which electric and hand trucks are constantly winding to deliver molding compounds to the presses and to carry molded parts to the tumbling and finishing departments.

At one side are assembled all the heavy presses; in the center are the medium-sized and side-ram presses; while at the right there is a battery of ninety-two, 3-inch to 10-inch presses of G. E. manufacture and design, and injection molding machines enclosed by partitions. Off one end of the molding room is the preform storage space and next to that is a large separate room for mold storage laid out with row after row of substantial steel racks. Each mold, together with fixtures, special tools and gadgets that go with it, has a place in the racks and is catalogued for easy reference. There are in this room at the present time about 6000 active molds, with a value of approximately four million dollars. Stored in the Meriden and Fort Wayne plants are 2700 additional active molds.

Off the other end of the molding room is a huge power room which accommodates 125-ton accumulators, air compressors for air pressure power, and large oil-fired boilers which supply hot water at a pressure of 200 pounds per square inch at a temperature of 370 deg. F. to provide heat for the supertherm system. All of the equipment in this power plant is in duplicate to assure continuous operation and to prevent any possibility of interruption. Aside from the battery of special presses which we shall describe later, perhaps the most novel feature of the new plastics molding plant is the installation of the supertherm system for heating molds.

In the former building, the molds were heated by steam furnished from the central boiler plant, but investigation of the most modern installations abroad, in England and on the Continent, showed that the use of "superheated water" was fast replacing that of steam. This resulted in the installation of the supertherm system which is the first application to molding in this country and the largest of the systems so far undertaken here.

Water in the boilers is at the same pressure and temperature as the steam. Therefore, if the water is circulated at or above boiler pressure, the same temperature is available at the presses. Heat is extracted from the water, thereby reducing its temperature a very small



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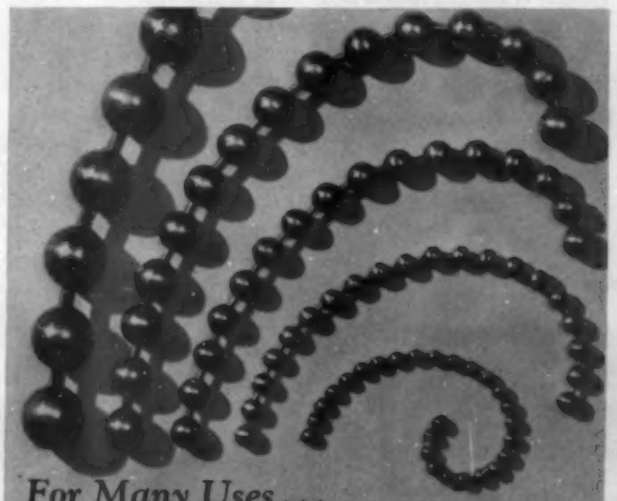

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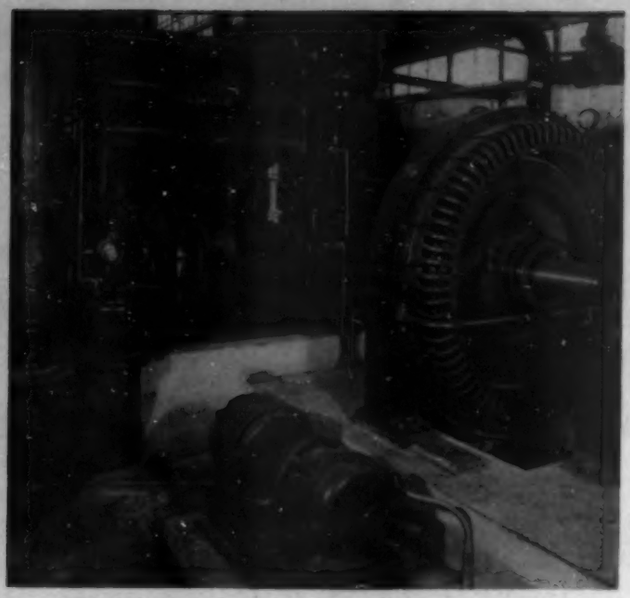

Air compressor driven by G. E. synchronous motor

amount; the water is then returned under full pressure in a closed system to the boiler. No traps or other devices at the presses are necessary, and full recovery of the unused heat is obtained. By means of recirculation the system temperature as a whole is controlled at one central point in the boiler house. It is also possible to vary the temperatures within limits at each individual press.

For a given volume and pressure, water has vastly more heat stored in it than steam; therefore, there is a huge reservoir of heat in the boilers and mains ready to go to work, and thus sudden large demands can be more readily made with constant firing rates in the boiler room than with steam. Boiler pressure and temperature are more evenly maintained and presses can be heated up faster and kept at a uniform temperature. With constant circulation through the molds at steady rates, there is more uniform distribution of heat than with steam, due to the absence of air pockets, variations of pressure and poorly working traps or orifices, common with the steam system.

The water being constantly recirculated, the closed system is cleaner and free of scale and corrosion, which will have a great bearing on both maintenance and length of life of boilers, piping, etc., and also preserves full generating capacity. In some presses it has been found that ability to secure full temperatures with uniformity at all times results in an increase of production. It is known that maintenance has greatly decreased, due to absence of traps or orifices in return lines,

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and also from preliminary checks for performance that the new system is circulating to the molding room about 30 percent less heat than was required when using steam. This saving is partly due to inherent and unavoidable losses of the steam system, and partly because press operators cannot waste the heat in the closed hot water system.

It is interesting to note that while the boilers have been fitted for high pressure hot water distribution to the press room, steam is also taken from the same boilers to serve certain pumps, when desired, and the exhaust from these pumps is used in winter for heating the plant and offices.

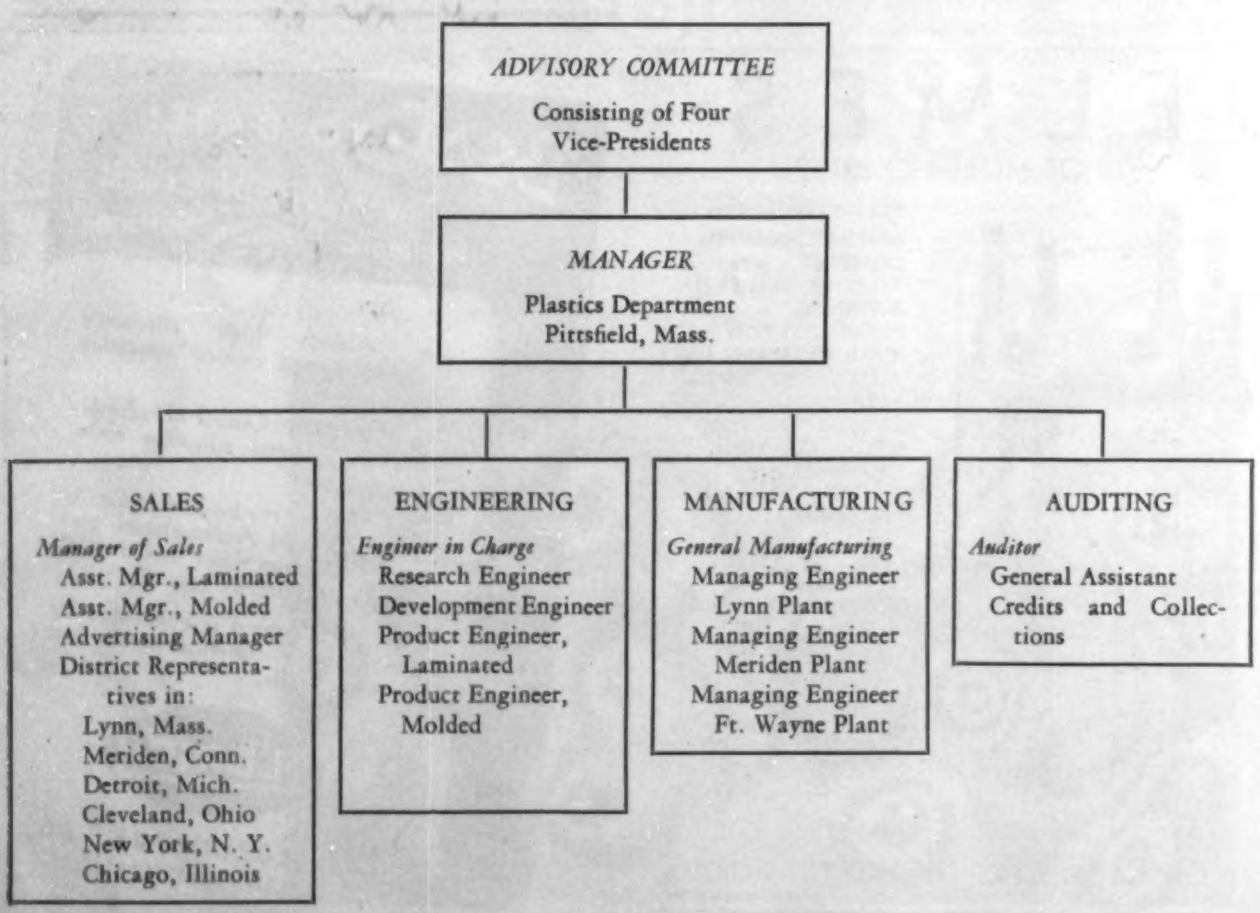
The second unique innovation in the molding room is the battery of ninety-two special presses designed and built by the G. E. plastics organization. The general foreman of the molding room, who was largely responsible for the original designs and superintended assembly and installation, outlined for our benefit the salient features that characterize their operation.

"Perhaps two of the most outstanding advantages," he says, "are conservation of space and improved sanitation. The presses are light enough in weight so that four of them, with 3-inch, 5-inch, or 6½-inch diameter rams may be placed on a table, about 135 inches long, by 24 inches wide and 36 inches high, that has but four legs, one at each corner. Presses with 8-inch or 10-inch diameter rams require more space and consequently, units of this size consist of two to a table. The units may be placed quite close together with room enough between for the operator to work. To illustrate this, our present battery of ninety-two presses occupies a space not more than 60 feet long and 18 feet wide.

"With the presses built up on these tables, keeping the area around them clean is a simple chore as compared with the effort necessary to clean around the big cast steel bases on ordinary presses. Further sanitation is achieved by using air rather than water for pullbacks and knock-outs. Originally, hydraulic cylinders operated by water were used on top of the presses. Over the week-end when the press was idle and the mold cold, the water would occasionally drip down into the mold, causing rust. Any molder can tell you that molds are costly to polish and even when polished after rusting are likely to prove troublesome in operation. Too many Monday mornings we found it necessary to spend three or four hours polishing rusted molds before production could proceed. To overcome this annoyance, we made up two

PERSONNEL CHART

PLASTICS DEPARTMENT, GENERAL ELECTRIC COMPANY



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Serving most of the leading molders in the country!

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IS USED BY THE
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DEPARTMENT

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in the manufacture of Textolite plastics products in their new modern molding plant at Pittsfield, Mass.

Vermont Asbestos Corporation offers various grades of asbestos fibre well suited for use in plastics.

Samples and prices on application.

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500 Fifth Avenue New York, N. Y.

4-inch air cylinders giving a ton for the two cylinders, 1000 pounds each or the equivalent of what we formerly had, but using 80 pounds of air pressure where previously 2000 pounds of hydraulic pressure were required.

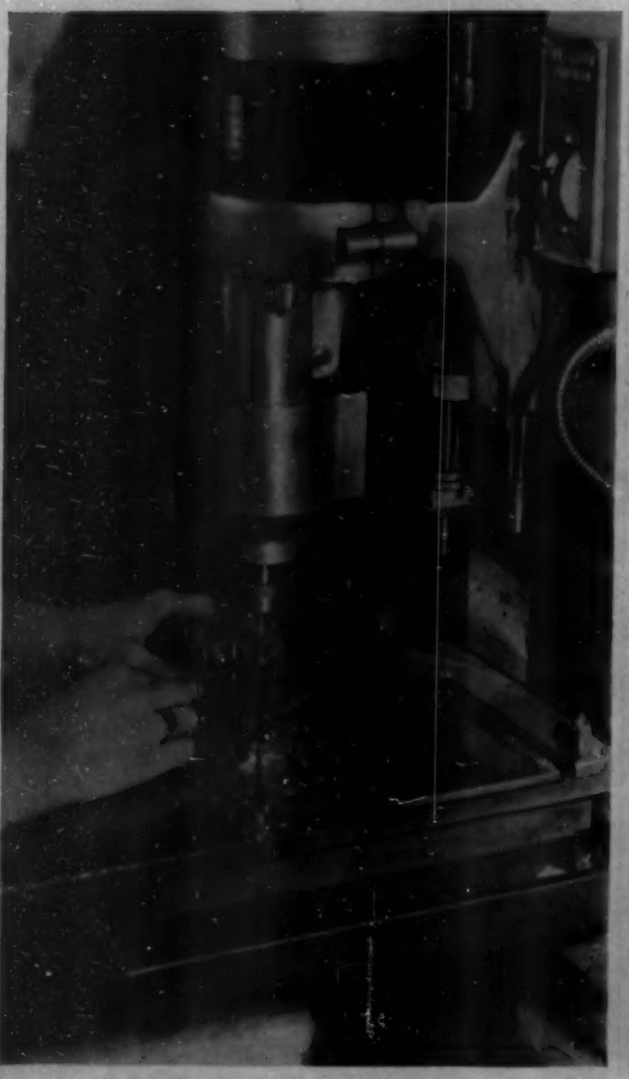
"By using air pressure we accomplished two objectives: First, we entirely eliminated water dripping which results in lowered maintenance costs. Second, the life of the packings in these cylinders was prolonged due to much less line pressure. We seldom repack one of these air cylinders. This seems almost phenomenal when you consider that in using hydraulic cylinders, some of them have to be packed very frequently because of leakage. Although air cylinders may leak once in a while, no damage results except a loss of air.

"Knock-out bars on molds have always been a source of trouble. Some molds have bars to push down; others have an inverted bar to lift up, and when the mold is changed it is no easy task to invert the hydraulic cylinder. On our new presses we have installed one air cylinder facing up and another facing down with rods extending down the sides through the head for any necessary adjustments. When the mold is changed, there is usually air on one of the cylinders and the other lifts out without difficulty. The job is a matter of seconds where hours were spent previously in making a similar change.

"The 80-pound compressed air line for the operation of the cylinders is supplied from the same central compressor and distribution lines that supply the cleaning hoses. The cylinders "float" on the line and require no manual operation. Therefore no air is consumed except that lost by leakage. When the press is closed the piston forces the air in the cylinder back into the line."

The operating valves on the new presses are at a practical working level which before, has never been possible. On the old type press, the workman has to lean over, often quite low, to get at the valves which are placed below the level of the press. On the new G. E. presses all valves are in back of the table, out of the way, and the operating handle is the only part appearing in front. The operator can use the valves and carry on throughout

Tapping (left) is an important finishing operation where both speed and accuracy are required. Sanding (right) is another finishing operation which requires speed and skill to promptly and properly remove flash



Congratulations G.E.

On Your Modern Molding Plant

a symbol of successful application of sound chemical and engineering principles to the development and perfection of molding technique, and an omen of the increasingly important contribution of molded plastics to science, industry and the arts.

It is particularly gratifying to us to have been permitted to confer with your Laboratories in the selection and development of pigments to meet some of your special color requirements, and to have been selected as a source of supply for these important compounding ingredients.

C. K. WILLIAMS & CO.
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Experience in hundreds of installations has proved it will give long, satisfactory service

1—with a minimum of repairs.
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3—with low cost replacement units quickly installed.

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➡ **Manager-Sales Manager: Executive, technically trained, who knows both manufacture and marketing of Molded Plastics can help existing company to earn more money through better organization, improved methods and by the development of new lines and increased sales. Moderate salary with contract to share in profits. Interested also in contacting those with capital to invest or those who may be contemplating entering this rapidly expanding and profitable industry. Let's talk over the possibilities and history of Plastics. Reply Box 217, Modern Plastics.**

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➡ **FOR SALE—Tilting Head Hydraulic Presses, used. Immediate Deliveries. Poinsettia, Inc., Pitman, New Jersey.**

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➡ **FOR SALE: 1—Colton No. 5, Preform Machine 2½"; 1—Stokes "DD" Rotary Preform Machine, never used; 1—Colton No. 3, Rotary Preform Machine; 4 other Preform Machines single punch up to 2"; 4—Adamson Hydraulic Presses 24" x 28", 20" rams; other Hydraulic Presses all sizes. WANTED: Accumulators, Hydraulic Presses, Ball Mills, Mixers, Sifters, etc. Send for complete list. Reply Box 218, Modern Plastics.**

MOLDERS OF ALL PLASTICS

When American Insulator engineers tackle your job, they do not start out with prejudice in favor of any special molding material. Since they are equipped to work all materials, the only consideration is the choice of that one which best serves your purpose. A mighty important point to consider when selecting your molder.

AMERICAN INSULATOR CORPORATION
New Freedom Pennsylvania
Molders of cold molded composition: Bakelite, Durez, Plaskon, Beetle, Tenite, Lumarith, Lucite, Thiokol, Plastacele, Fibestos.

the day standing upright which means that his labor is less fatiguing. One operator can take care of as many as eight of the presses or as few as four depending upon the type of work going through. Another advantage of the new presses, we are told, is that any unit can be picked up and moved to some other part of the room without dismantling the piping, which is built in to become a part of the unit.

The regular presses in the molding room range from eight tons with 3-inch diameter rams to five-hundred tons with 24-inch diameter rams. They are hydraulically operated and air power is used only for knock-out and pull-back purposes. The molding room, under normal conditions, runs 24 hours a day in three shifts, five days a week.

Finishing department

When the molded parts leave the molding room they pass to a pre-inspection room where defective parts are separated and immediately reported back to the molding room so that the fault can be corrected. They then go to a counting room where the press operators' count is verified by physical count or "weigh" count. Most small parts are cleaned by tumbling in various types of barrels at different speeds. Work is fed to the hand and machine finishers on 4 conveyors, each 75 feet long. On both sides of them are work benches at which the operators are seated. Where quantities justify the set-up, there is a battery of automatic cleaning, drilling and tapping machines at one end of the room.

At the end of each conveyor inspectors check all parts and the necessary gauges and fixtures are filed in cabinets adjacent to their area. One of the modern features of this inspection is a fluoroscope which is used to check the location and condition of inserts or to reveal any interior defects such as voids or low density. As the pieces leave the inspectors they are picked up by the packers in the adjoining shipping department where they are packed in cases and made ready for shipment.

After completing such a trip of inspection one can't help being impressed with the importance and the magnitude of the plastics industry. And it is obvious that the General Electric Company, in its new plant, is admirably equipped to take every reasonable advantage of this rapidly increasing business and to render its clients economical and dependable deliveries.

Central aisle in the Finishing Department showing two of the 75 ft. conveyor belts which carry the molded parts to finishers and inspectors, eventually depositing them in the shipping department at the far end